M/s Andhra Pradesh Gas Distribution Corporation Ltd. (APGDC)

A Joint Venture Company between GAIL Gas Limited (a wholly owned subsidiary of GAIL (India) Ltd.), a Central Government Public Sector Enterprise (PSU) and APGIC, an Andhra Pradesh State Government Public Sector Enterprise

KAKINADA-SRIKAKULAM PIPELINE PROJECT (PHASE-I)

CORRIGENDUM #1
to
BID DOCUMENT
FOR

TELECOMMUNICATION SYSTEM

OPEN DOMESTIC COMPETITIVE BIDDING

E-Tender ID 140044

Bid Document No.: 05/51/23QC/APGDC/097

PREPARED AND ISSUED BY

MECON LIMITED

(A Govt. of India Undertaking)
Delhi, India

Andhra Pradesh Gas Distribution Corporation Ltd.	CORRIGENDUM # 1 For TELECOMMUNICATION SYSTEM For KAKINADA-SRIKAKULAM PIPELINE PROJECT (PHASE-1) Tender No. 05/51/23QC/APGDC/097 (E-Tender ID 140044)	MECON LIMITED

Date : 31.08.2017

Sl. No.	Description	Volume	Page No.	Clause / Para / Section	Amendment / Addition / Modification / Deletion	
1	Vol.-II of II	II	-	-	Modification	Revised Vol.-II of II enclosed herewith as Annexure-I shall supersede Vol.-II of II earlier uploaded on MECON/ APGDC website.

All other terms and condition shall remain unchanged.

Annexure-I to Corr. #1

M/s Andhra Pradesh Gas Distribution Corporation Ltd. (APGDC)

A Joint Venture Company between GAIL Gas Limited (a wholly owned subsidiary of GAIL (India) Ltd.), a Central Government Public Sector Enterprise (PSU) and APGIC, an Andhra Pradesh State Government Public Sector Enterprise

KAKINADA-SRIKAKULAM PIPELINE PROJECT (PHASE-I)

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VOLUME – II OF II (R1)

PREPARED AND ISSUED BY

MECON LIMITED

(A Govt. of India Undertaking)
Delhi, India

INDEX

VOLUME–II OF II

TELECOMMUNICATION SYSTEM FOR NATURAL GAS PIPELINE PROJECT KAKINADA-SRIKAKULAM PIPELINE PROJECT

A. MATERIAL REQUISITIONS

B. VENDOR DATA REQUIREMENT

C. VENDOR DRAWING/ DATA APPROVAL PROCEDURE

D. VENDOR DRAWING/ DOCUMENT SUBMISSION SCHEDULE

E. PARTICULAR JOB SPECIFICATION FOR TELECOMMUNICATION SYSTEM
(PJS No. MEC/05/E5/I/PJS-097)
TECHANICAL SPECIFICATION FOR TELECOMMUNICATION SYSTEM
(TS No. : MEC/05/E5/APGDC/TS-097)

ANNEXURES : I TO XV

ANDHRA PRADESH GAS
DISTRIBUTION CORPORATION LTD.,
HYDERABAD

KAKINADA-SRIKAKULAM PIPELINE PROJECT
(KSPL PHASE-1 PIPELINE)

MATERIAL REQUISITION
FOR TELECOMMUNICATION SYSTEM

MR NO.: MEC/S/05/E5/T/23QC /APGDC/097
Bid Document No. : 05/51/23QC/APGDC/097

PREPARED AND ISSUED BY

MECON LIMITED
(A Govt. of India Undertaking)
Delhi, India

0	22.02.2017	ISSUED FOR BID	Yashipriya	Ratnadeep	Pankaj Shrivastava
Revision	Date	Description	Prepared by	Checked by	Approved by

ITEM : **TELECOMMUNICATION SYSTEM**
PROJECT : **KAKINADA-SRIKAKULAM PIPELINE PROJECT**
MR No. : **MEC/S/05/E5/T/23QC /APGDC/097**
BID Doc. NO. : **05/51/23QC/APGDC/097**
CLIENT : **ANDHRA PRADESH GAS DISTRIBUTION CORPORATION LTD**

Item No.	DESCRIPTION	UNIT	QTY
	Project Management, System Design, Detail Engineering, Supply of Materials, Inspection & Factory Acceptance Testing (Equipment & Integrated with sub-system) & Testing of sub system, Packaging, forwarding, Insurance, Transit Insurance, Shipping, Port Handling, Custom Clearance, Inland Transportation to store, Supply of all related erection goods including Mandatory spares, Commissioning spares, power supply, surge protection device, Loading, Unloading & Handling, Storage & Safe custody, Transportation from store to site, Supply of all type of Erection Items, Erection, erection of foundation support channel on trench for panel erection, Consumer connectivity, Pre-commissioning activity, Testing, Trial Run, Commissioning, Training, Warranty, Extended warranty, Post Warranty Maintenance contract – Comprehensive for 3 year, Including minor civil works, documentation of SDH based Digital Fibre Optic Communication System with NMS covering IP EPABX system, CCTV system, Leased Lines, Video Conferencing system, Complete in all respect and shall be executed as Turnkey individual work contract basis as per Particular Job Specification (PJS) No.: MEC/05/E5/I/JS-097 Rev-0, Technical Specification (TS) No: MEC/ 05/E5/APGDC/TS-97 Rev -0 and consists of following. Location details will be provided after order placement or during detailed engineering.		
T.S	**Supply**		
T.S.1	OFC based STM- 16 SDH equipment, fully wired with Rack as per Particular Job Specification (PJS) and Technical specification (TS).	Sets	5
T.S.2	OFC based STM-4 SDH equipment, fully wired with Rack as per Particular Job Specification PJS and Technical specification.	Sets.	11
T.S.3	Primary Reference Clock (Cesium and GPS) with antenna & necessary cables, accessories as per Particular Job Specification (PJS) and Technical specification (TS).:- (tentative at Kakinada-MCS).	Set	01
T.S .4	GPS (Secondary Reference Clock with SSU as per G- 811 based on GPS) with antenna & necessary cables, accessories as per Particular Job Specification (PJS) and Technical specification (TS).:- (tentative at IP Station -3 BCS)	Set	01
T.S.5	SDH Network Management Centre (NMS) with Client work station and work station shall be extended to IP-3 BCS, Rack including all Hardware & Softwares, accessories for Telecommunication System complete as per Particular Job Specification (PJS) and Technical specification (TS).	Set	01
T.S.6	IP EPABX SYSTEM fully wired configured and equipped with all interfaces, cables, connectors, MDF, NMS for 150 Lines (120 Analogue & 30 IP) Expandable to 200 Lines as per Particular Job Specification (PJS) and Technical specification (TS). (At Kakinada)	Set	01

Item No.	DESCRIPTION	UNIT	QTY
T.S.7	Local Craft Terminal with required software for Optical system SDH, CCTV and IP EPABX, VC as per specifications as per Particular Job Specification (PJS) and Technical specification (TS). (for MCS & BCS)	Sets	02
	Telephones as per specifications -		
T.S.8	Explosion Proof analogue Telephones along with Acoustic Booth (including howler & flashing beacon full IP 66 enclosure type) with required hardware, cabling / accessories as per Job Specification PJS & TS.	Sets	11
T.S.9	Ordinary (analog) telephones with required hardware, cabling / accessories as per Job Specification PJS & TS.	Sets	63
T.S.10	IP telephones with required hardware, cabling / accessories as per Job Specification PJS & TS.	Sets	16
T.S.11	IP telephones with Video screen with required hardware, cabling / accessories as per Job Specification PJS & TS.	Sets	02
T.S.12	Weather Proof analogue Telephones with required hardware, cabling / accessories as per Job Specification PJS & TS.	Sets	04
	CCTV Systems and Cameras –		
T.S.13	CCTV System consisting of Network Video Recorders (NVR) server, client work stations including necessary hardware, software, storage with additional work station, necessary Ethernet switches, Converter, Gateways, furniture and accessories complete with required server Rack, cabling / accessories as per Job Specification PJS and necessary accessories as define in specifications. (Tentative server at MCS and BCS locations in main & failover configuration; all cameras shall be available for viewing to both the locations however storage will be at respective server location only- refer scope in PJS, TS & proposed Telecom network for battery limit of each server)	Sets	02
T.S.14	PTZ Camera with IR illuminator with housing accessories, Mounting Arrangements, Ethernet switches, Converter, Gateways and necessary accessories as per Job Specification PJS & TS.	Sets	22
T.S.15	Fixed Camera with IR illuminator with housing accessories, Mounting Arrangements, Ethernet switches, Converter, Gateways and necessary accessories as per Job Specification PJS &TS.	Sets	33
T.S.16	**Video Conferencing System:** Video Conferencing system HD end point equipment with inbuilt MCU, VCE with LED screen (40") with Integrations with other VCE of client (if required), furniture, documentations completely in all respect as per the specification. (For MCS & BCS) as per Job Specification PJS & TS.	Sets	02

Item No.	DESCRIPTION	UNIT	QTY
T.S.17	Test Instruments as per the specifications having following: a) OTDR Meter : 01 No. b) Laser Source : 01 No. c) Power Meter : 01 No. d) Ethernet tester : 01 No. e) 24 Port switch (Managed) : 01 No. f) 8 Port switch (Managed) : 01 No. g) SDH analyser : 01 No. h) Digital Multimeter : 01 No. i) Industrial standard Tool kit for telecom equipments with leather bag. : 01 Set	Set	01
T.S.18	Mandatory Spare for all supplied equipments such as STM 16 & 4, CCTV Cameras (Fixed & PTZ), IP EPABX System & phones, Gateways, power supply, VC equipment, Converters: (Bill of Material has to be provided along with offer, any fraction quantity should be round off to nearest number in higher side). **Unit rate for Mandatory spares with cards details, part no., make etc. shall be given separately with the offer & price part.**	Lot	01
T.S.19	Extended Warranty **per month** (to be applicable if site work delayed not attributed to contractor, the main warranty extended for the delayed period on completion and handing over of work and start of main warranty. (Refer Note 6)	Months	12
T.E	**Site Work:-** Installation, Integration, Site Testing, Trial Run & Commissioning (including all supply of installation materials, accessories, connectors, Distribution boxes, MDF, cables {co-axial cable, multi-pair armoured & unarmoured telephone cables, Ethernet Cables}, pole {maximum 3-5 mtr} with shades & mounting arrangement for CCTV cameras, civil foundation for Porta cabin & pole, Power testing of already laid 24 F OFC fiber, OFC connectors all work for SDH system, CCTV system, IP EPABX system, Leased lines, warranty, Post warranty Maintenance as per Job Specification PJS & TS.		
T.E.1	All Site work as define above for respective stations (all Despatch, SV, IP stations and Receiving stations) complete in all respect for SDH system, IP EPABX system with Telephones, CCTV System with Cameras, Clocks, VC system as per Job Specification PJS & TS.	Lots	16
T.E.2	All Site work as define above for new NMS system of SDH, IP EPABX, CCTV System, Clocks, VC equipment, other related activities at respective sites.	Lot	01
T.E.3	Leased lines (2 mbps) for SCADA with end to end solution (Hardware & software as required) complete in all respect for 02 year from the date of acceptance as per Job Specification PJS & TS. Lease lines are required **as per list attached with PJS)**. (Quantity may vary and will be finalised during detailed engineering.) For a particular station leased line to MCS/BCS shall be provided from two different service providers. Item will be executed only as per site requirement. (Tentative locations as Kakinada to IP-03 cum Backup stations)	Lot	01

Item No.	DESCRIPTION	UNIT	QTY
T.E.4	Leased lines (3X2 mbps) (for SDH NMS, IP EPBX, voice & Data) with end to end solution (Hardware & software as required) complete in all respect for 02 year from the date of acceptance as per Job Specification & TS. (Quantity may vary and will be finalised during detailed engineering.) (Tentative locations as Kakinada to RT HPCL -Vizag location)	Lot	01
T.E.5	Rectification and Restoration of damaged Optic Fibre Cable (All works including Identification of the fault, Test of the fibre for the smooth operation on wavelength, Power Testing of laid OFC, providing jointing pit, jointing marker, electronic marker & ready for Telecom equipments including all supply as required) as defined in the scope of work.	Lots	6
T.E.6	Training for SDH, CCTV system, IP EPABX & GATEWAYS, equipment with respective NMS, VC equipment, Test instruments at site with OEM and at OEM works / integration centre as defined in PJS of tender document.	Lot	1
T.E.7	All inclusive **per month rates** for maintaining the store at site (for the supplied material) during the extended period as required (payable if site is not ready even after 6 months of actual date of completion as per terms & condition of contracts and as define in the tender scope of work). (Refer Note 7)	Months	12
T.E.8	All inclusive Man-day rates for services such as (all or less) installation/ supervision / configuration / integration /Testing & Commissioning of Telecommunication equipments valid for the next 7 years from FOA within Andhra Pradesh regions applicable as & when required. The rates shall be valid for the next 7 year with the escalation from 3rd Year (from FOA) of 6 % of unit rate per year (date of FOA) as per SOR. (Note -9)	Man-days	20
T.PW	**Post warranty maintenance contract (PWMC) – Comprehensive for all supplied equipments** as define in the Particular Job specification / bid document for complete telecom system (all supplied SDH system, IP EPABX System & Telephones, CCTV system & cameras and VC system devices for consumer connectivity equipments including respective NMS etc) for 3 years after completion of main warranty / extended warranty complete in all respect as define in the particular Job specification. Payment will be made on quarterly basis. (Note -8)	Lot	01

NOTES:-

1. Bidder shall quote for all the items.
2. Bid offer will be evaluated package wise. All the items of Andhra Pradesh Region will be considered for evaluation purpose. Completion of total work as a TURNKEY work is Bidder's responsibility.
3. Commissioning spare will be part of the offer.
4. Details of Mandatory spares with part no., make etc. shall be given separately with the offer & price part.
5. The Items, quantities and the location of the stations may very / change; bidder shall take prior approval for procurement and erection from EIC/ Client.
6. Bidder has to quote Extended Warranty **per month** (along with OEM). The Main warranty is for period of 24 months (two years) from the date of successful completion of trial run / acceptance of the system by

the owner or 28 months from the actual delivery of material at site after IFAT) as per the terms & condition of contract and as define in clause no. 7.0 of PJS).

The extended warranty per month rate will be used to extend the main warranty for the delayed site work & handing over of system so that at the time of actual completion / handing over main warranty shall be available for 24 months. Period for extension for the delay period only or will be finalised by the client as per the requirements and accordingly payments will be made as per SOR rate. Refer Clause no. 24.0 of Particular Job specification of the tender.

7. Bidder has to complete the work as per the schedule, if the site is not ready even after 6 months of the completion schedule as define in the contract then bidder may compensate the expenditure of store (as per all inclusive rate per month available in the tender) till the readiness of the site. The payment will be made from seventh month (No payment upto six months from date of completion) onward from actual date of completion as per the certifications by EIC/ Client. In this situation, after intimation from APGDC, the site work has to be completed within the time stipulated for site works as per tender.

8. Post warranty maintenance contract – comprehensive for all supplied equipments for 3 year as define in the bid shall be provided by original equipment supplier along with bidder for the 03 years of period specified in the tender. However APGDC may placed separate order for Post Warranty Maintenance as per terms & condition of the contract. PWMC work will start after completion of Main warranty.

9. Bidder shall quote All inclusive Man-day rates for services such as (all or less) installation/ supervision / configuration / integration /Testing & Commissioning Telecommunication equipment valid for the next 7 years from FOA within Cauvery regions applicable as & when required. The rates shall be valid for the next 7 year with the escalation from 4th Year (from FOA) of 6 % of unit rate per year (from date of FOA) as per SOR.

10. 2 year Operation & maintenance OEM suggestive spares, each module, with complete list, part no, unit rate shall be provided. The validity of rates shall upto contractual period including PWMC from date of commissioning / acceptance of complete work (i.e. 2 years warranty + 3 years PWMC- total 5 year) . Refer PJS clause no 7.0 for details.

VENDOR DRAWING/ DATA APPROVAL PROCEDURE

TELECOMMUNICATION SYSTEM FOR NATURAL GAS PIPELINE PROJECT KAKINADA-SRIKAKULAM PIPELINE

1. Vendor must take care of the following while submitting drawings and documents for review as indicated in Vendor Data Requirements enclosed.

   A blank space measuring 75mm W x 40mm H shall be provided on all vendor drawings for marking review codes etc. by MECON LIMITED.

   The review of vendor drawings shall be done as applicable under the following review codes:

   a) Review Code Approved : Approved

   b) Review Code Approved As Noted: Proceed with manufacture/ fabrication as per commented drawings. Revised drawing required.

   c) Review Code Not Approved: Document does not conform to basic requirements as marked. Resubmit it for review.

2. Review of the vendor drawings by MECON would be only to check compatibility with basic design and concepts and would in no way absolve the manufacturer/ fabricator of his responsibility to meet applicable codes, specification and statutory rules/ regulations.

3. For drawings/ documents indicated as FOR INFORMATION in the Vendor Data Requirement, Vendor must mark FOR INFORMATION ONLY on the submitted drawings/ documents.

MECON Limited

Vendor Drawing/ Document Submission Schedule

Client/ Project: Natural Gas pipeline for Kakinada-Srikakulam pipeline Project **BID Doc No.: 05/51/23QC /KSPL/094** **Tender No.:**	**Vendor's Name:**	**Contact Person (Name/ Tel/ Fax/ email) :**	**Status Date:**

Item Description : **Telecommunication System**	**PR No.:** **Date of LOI:**	**Review Status Code:** 1. APPROVED - No Comments 2. APPROVED AS NOTED - Proceed with manufacture/ fabrication as per commented document. Revised document required. 3. NOT APPROVED Document does not conform to basic requirements as marked. Resubmit for Review. R: Retained for Reference V: Void
Doc No. MEC-S-05-E5-23QC- 97-F01, Rev 0	**PO No.:** **Date of PO:**	

Department :	**Contact Person:**

S. No.	Drawings / Documents as per MECON Vendor Data Requirement	Vendor Drg/ Doc No. Title	Category Review (R)/ Records (I)	Schedule Date of 1st Submission (Rev. 0)	Anticipated (Ant) Date of submission by vendor Actual (Act) Date of submission by vendor Date of Return (Rew) by MECON Review Status (Code)	Rev. 0	Rev. 1	Rev. 2		Form Electronic (E)/ Print (P)	Remarks
					Ant						
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VENDOR DATA REQUIREMENTS

The table hereunder specifies the quantities and the nature of the documents to be submitted by the Vendor to the Client / Consultant for Approval / Record.

Any document, even when preliminary, shall be binding and therefore duly identified and signed by the Vendor. It shall bear the Project reference, the PO no. and the document identification number.

THE DOCUMENTS ARE FULLY PART OF THE SUPPLY WHICH SHALL BE COMPLETE ONLY IF AND WHEN THE DOCUMENTS COMPLYING FULLY WITH THE MATERIAL REQUISITION EQUIREMENTS ARE RECIVED BY THE CLIENT / CONSULTANT.

Sl. No.	Documents and Data	Along with Quotes	Certified information required after Purchase Order			
			Soft Copy	Printed Matter	Date needed from FOI	Date Promised
1	Network Management System (NMS)	1	4	4	04 weeks	-
2	Functional design Specification for Telecommunication System and sub system	1	4	4	04 weeks	-
3	Telecom Cabinet Wiring diagram	-	4	4	08 weeks	-
4	Filled various From (attached with the tender) duly filled and signed by the bidder	1	-	-	-	-
5	Bill of Material (Station wise)	1	4	4	08 weeks	-
6	List of Mandatory Spares	1	4	4	08 weeks	-
7	List of Commissioning Spares	1	4	4	08 weeks	-
8	Control Room Layout for each station	-	4	4	12 weeks	-
9	Equipment Interconnection diagram including details of various interfaces etc.	-	4	4	12 weeks	-
10	Telecom Panel internal Layout including mounting arrangement, interconnection	-	4	4	12 weeks	-
11	Internal layout of Telecommunication cabinets, consoles, desks if reqd including mounting arrangement, interconnection etc.	-	4	4	12 weeks	-
12	VC equipments and system	1	4	4	08 weeks	-
13	EPABX document	1	4	4	08weeks	-
14	CCTV System documents	1	4	4	08 weeks	-
15	Standard Telecommunication Equipment Manual for operation & maintenance	-	4	4	-	W/S
16	User guides, maintenance & configuration manuals for all supplied equipments / subsystems	-	4	4	-	W/S
17	Quality Assurance Plan	1	4	4	04 weeks	-
18	FAT Procedure	-	4	4	12 weeks	-

19	SAT Procedure	-	4	4	12 weeks	-
20	Test Run Procedure	-	4	4	12 weeks	-
21	IP address & protocol structure at each station	-	4	4	12 weeks	-
22	Datasheet of Sub system	-	4	4	12 weeks	-
23	Channeling Plan & Link Engineering	1	4	4	12 weeks	-
24	Optical Budget System Engineering	1	4	4	12 weeks	-
25	Station wise power consumption calculations of Telecom Eqpt & sub system at MS and other stations	1	4	4	12 weeks	-
26	Earthing arrangements	-	4	4	12 weeks	-
27	Necessary Exp. Proof certificate as applicable	-	4	4	12 weeks	-
28	List of spares for O&M for main & sub system	1	4	4	12 weeks	-
29	List of special Tools & Tackles	1	4	4	12 weeks	-
30	Project execution schedule	-	4	4	2 weeks	-
31	Unpriced order copies of sub items and FDS	1	4	4	04 weeks	-
32	Leased line confirmation from service provider with installation details	1	4	4	12 weeks	-

Notes:

1. The above VDR based on the schedule (Supply: 16 weeks ETC: 24 weeks from FOI; any different schedule it will be reconfirmed during placement of order.
2. Categories proceeded with "*" will be approved for fabrication by MECON LIMITED. The remaining drawings are needed for information only.
3. Fold all drawing to 210mm x 297mm.
4. Vendor to provide all printed matter and the soft copy to MECON LIMITED.
5. Legends:
   A/C = As completed, W/S = With Shipment, W= Weeks
6. Final technical document file shall be supplied in hard copy as indicated and in electronic format (.pdf Acrobat files) on two (2 Nos.) CD-ROM
7. All these documents shall be submitted along with dispatch of the system to site
8. FAT procedure documents must include clause wise reference of tender specification for its compliance. This document shall be prepared in consultation with owner / owner's representative
9. The documents / information required with offer sheets to be furnished otherwise the offer shall be liable for rejection.
10. **During detail engineering stage, 3 sets of printed matter and 2 soft copies shall be submitted till the final approval of documents/drawings. After approval 6 sets has to submit.**
11. **As built Drawings & Documents – 6 sets with 6 sets soft copies (contents – PO, FDS, FAT, IC, SAT, testing reports, Commissioning & Handing over Reports)**

ANDHRA PRADESH GAS
DISTRIBUTION CORPORATION LTD.,
HYDERABAD

NATURAL GAS PIPELINE PROJECT
KAKINADA-SRIKAKULAM PIPELINE PROJECT
(KSPL PHASE-1 PIPELINE)

PARTICULAR
JOB SPECIFICATION

TELECOMMUNICATION SYSTEM

PJS No.: MEC/05/E5/I/PJS-097
BID Doc No. : 05/51/23QC/APGDC/097

PREPARED & ISSUED BY

MECON LIMITED
(A Govt. of India Undertaking)
DELHI - 110092

TABLE OF CONTENTS

****

1. INTRODUCTION

1.1. The purpose of this specification is to define the outline requirement of Telecommunication System for APGDC's NATURAL GAS PIPELINE PROJECT FOR KAKINADA-SRIKAKULAM PIPELINE Project - in the state of Andhra Pradesh for transportation and distribution of re-gasified liquid natural gas (RLNG) to various potential/ prospective consumers along the pipeline route from Kakinada RLNG terminal (FSRU) near Vakalapudi light house at Vakalapudi, including all Despatch Terminals/ Receiving Terminals, Sectionalising Valve (SV) stations, Intermediate Pigging stations used for NG transporting services.

1.2. In case of any conflict between the specifications, enclosed data sheets, enclosed attachments, related codes and standards, the same shall be informed at the bid stage, after award of contract change will not be permitted.

1.3. Vendor shall be responsible for selection of the correct system to meet the purchaser's specifications at the time of bid. In case of any modification / change in selected equipment model at a later date to meet the Purchaser's Specifications, the same shall be done by the vendor without any price and delivery implications.

1.4. BRIEF PROJECT DETAIL

M/s Andhra Pradesh Gas Distribution Corporation Ltd. (M/s APGDC) has awarded M/s MECON Limited as project management & consultancy (PMC) services for laying 24"x23 Kms. (Appx.), 18"x136 Kms.(Appx.), 12"x10 Kms.(Appx.), 8"x6 Kms.(Appx.) & 4"x2 Kms.(Appx.) long pipeline (Phase-1 pipeline of Kakinada-Srikakulam proposed pipeline (KSPL pipeline)) in the state of Andhra Pradesh for transportation and distribution of re-gasified liquid natural gas (RLNG) to various potential/ prospective consumers along the pipeline route from Kakinada RLNG terminal (FSRU) near Vakalapudi light house at Vakalapudi.

The KSPL Phase-1 network will connect different consumers such as APGDC, Essar Steels, Andhra Petro Chemical & HPCL refinery, Vizag along the pipeline in the state of Andhra Pradesh. This Phase-1 main pipeline (24"NB/18"NB) will be laid up to Srikakulam TOP & spur line (18"NB/12"NB/8"NB/4"NB) upto HPCL Refinery/Andhra Petro Chemical.

A dedicated optical fiber based digital telecommunication system, CCTV System, IP EPABX System, Video conferencing equipment, dedicated leased lines installed to meet the optimum operation, maintenance and safety requirements of pipeline. The telecommunication system provides various facilities such as voice, data and video communication facilities among various attended and unattended stations of the KSPL pipelines. The transmission system will be based on SDH, which act as transport backbone of the entire digital transmission system.

For back up connectivity, Lease line to be hired from external service provider to meet the bandwidth requirement for SCADA and Telecommunication connectivity (to manage SDH, Data & Voice requirement) under Telecommunication system has been considered.

External hired dedicated n x 2 Mbps leased line (from the other service provider) has been envisaged between two locations, Master Management Station (MCS) proposed at Kakinada and backup / emergency Control station (BCS) proposed at IP-3 cum base station & RT HPCL Vizag as backup to OFC communication network of KSPL network to meet exigencies in case of an OFC cut/failure. If two lines requested from same location then same has to be provided from different service provider.

The Internet Protocol - IP based Telecommunication system comprise of SDH based OFC network system along with the pipeline to facilitate proper operational & management control of the pipeline and dedicated Telecommunication system in future. Two tier telecom network STM 4 /STM16 along with CCTV system, IP EPABX, Video conferencing system over SDH/OFC network and associated system is to be set up to cater Telecom and SCADA requirement.

2. SCOPE OF WORK

2.1 The Vendor's responsibility for completion of the Telecommunication system defined in this document shall be on turnkey basis.

Project Management, System Design, Detail Engineering, Supply of Materials, Inspection & Factory Acceptance Testing (Equipment & Integrated with sub-system, Packaging, forwarding, Insurance, Transit Insurance, Shipping, Port Handling, Custom Clearance, Inland Transportation to store, Supply of all related erection goods including Mandatory spares, Commissioning spares, power supply, surge protection device, Loading, Unloading & Handling, Storage & Safe custody, Transportation from store to site , Supply of all type of Erection Items, Erection, erection of foundation support channel on trench for panel erection, Pre-commissioning activity, Testing, Trial Run, Commissioning, Training, Warranty, Extended warranty, Post Warranty Maintenance contract – comprehensive for 3 year for all supplied equipment, Including minor civil works, documentation of SDH based Digital Fibre Optic Communication System covering IP EPABX system, CCTV system, Leased Lines, Video Conferencing Equipment Complete in all respect and shall be executed as Turnkey individual work contract basis as per this Job Specification and technical specification TS No : MEC/05/E5/APGDC/TS-97 Rev-0.

The proposed Telecommunication system shall comprise of SDH, IP EPABX, Telephones and accessories, CCTV systems with Cameras (PTZ & Fixed); Video conferencing equipment, dedicated leased lines from other service provider. As per requirements, the following has been proposed for KSPL pipelines.

- OFC based STM-16 & stm-4 SDH optical fiber based telecommunication system
- OFC based SDH Network Management Systems
- IP-EPABX System with NMS, IP, Analog, Exp / weather proof analogue phones
- IP CCTV PTZ & Fixed cameras with CCTV System
- Video Conferencing Equipments & System
- Leased Lines for backup communications.

2.2 Detailed Scope of work for Telecommunication System :

The proposed Telecommunication system / Network for pipeline of APGDC shall comprise of the following, for the technical specification refer TS No : MEC/05/E5/APGDC/TS-97 Rev-0 enclosed separately.

i) OFC based SDH Telecom system , SDH (STM -16 & STM -4) where SDH (STM-16) form the backbone, equipment fully wired with Rack, compatible to operate with ITU-T G-652 & G-655 fibre, configured and equipped with all specified interfaces, EOW & handset and capable of supporting specified interfaces with clocks, complete as per specifications.

The ring based dual Optical Fibre Pairs shall be created to connect stations on pipelines. The ring is based on sequential network topology with a redundant path. The proposed system shall use the latest technological advancements in SDH networks such as Virtual concatenation (VCAT) and link capacity adjustment scheme (LCAS). SNCP protection should be supported. All IP based equipments shall comply with IPV6 in addition to IPV4 and MPLS-TP Compliances.

The equipment configuration of spare telecom STM 4 (2 nos) will be similar to SV-2 type & STM- 16 equipment shall be similar to DT Kakinada type shall be considered.

ii) Network Management System for SDH

Network Management systems have to be provided for complete communications system along the pipeline route.

NMS of SDH (STM- 16 & STM-4) systems

To meet the manageability of SDH equipments, Vendor shall supply, install and commission new latest version of NMS system at APGDC Pipelines (tentative at Kakinada and work station extended to IP-3 cum backup station) for monitoring of OFC Communications system parameters.

SDH Network Management Centre (NMS) with Client work station, Sever Rack including all Hardware & Softwares, furniture, accessories as define in specifications shall be provided.

iii) PRC Clock (Cesium and GPS) at KAKINADA & Secondary clock GPS Clock (As per G- 811 based on GPS) at IP-3 with antenna & necessary cables, accessories shall be supplied as per specifications.

iv) Dedicated leased line (n x 2 mbps) for extension / backup of IP EPABX / SCADA / SDH equipment Management connectivity shall be provided as backup to OFC communication network to ensure that the Voice / data / SCADA / SDH management.

Total end to end solution for leased lines including procurement, supply, installation, testing, commissioning (Hardware & software as required) etc complete in all respect for 02 year from the date of acceptance. Lease lines are required as define in MR and as per Annexure - XIII. Leased line shall be provided from two different service providers. Item will be executed only as per site requirement.

Necessary router/switch/ DCN equipment as required for telecom network connectivity at respective location shall be provided with G.703 and Ethernet port at starts and end location of multiple leased line termination. The necessary modem to be supplied by Telecom vendor shall have **02 Nos. of G.703 & / 02 Nos Ethernet port as spare (finalized during detailed engineering)** after required ports considered for total connectivity as required refer Annexure – XIII.

Bidder shall be one point contact for all works including installation, testing, maintenance (limited to interfacing of leased network), etc for the above leased line till the end of warranty period for the complete telecom system.

All necessary arrangement & formalities, (including all communication with the service provider, etc) to provide the end solution shall be Bidders responsibility. The maintenance of lease line will be the responsibility of service provider initially for 2 years and then till the renewal of lease line contract. The start date will be considered from the date of establishing of the link between the respective stations. Owner's responsibility shall be limited to issue of necessary request letters seeking permission, as required.

vi) Design, Detailed engineering including link budget as per the calculation has to be provided by Telecom vendor. OFC for the pipeline will be laid by other contractor and handed over to telecom vendor in healthy condition after end to end power testing upto FTC end. Telecom vendor has to do splicing and termination of OFC on FTC Modify (if required) as per Telecom requirement as per the Network philosophy agreed with APGDC/PMC. Telecom vendor shall do power testing end to end of the fibre for the smooth operation on wavelength before taking over OFC for each sections / stations.

Any rectification work / modification required before handing over will be in other contractor's scope. However, if required, any rectification and restoration for any damaged / cut in laid OFC (fresh location not attributed to laying contractor) after taking over of OFC will be in bidder's scope and for this rate has to be quoted in the item provided in the SOR. These works include Identification of the fault, rectification, restoration, Power Testing of laid OFC, Earthing & readiness of OFC for telecom equipments

vii) IP EPABX system with MDF including all gateways and accessories as per tender specifications, Telephones (IP, ordinary, Weatherproof, Acoustic Telephone Booth with full enclosures, Howler & flashing beacon, Explosion proof Telephone), NMS (Network Management System with Work station, all software, laser A4 printer, All Communication cables, Power supply cables, earthing cables/wires, with necessary double compression cable glands, connectors and all necessary hardware required for erection work, necessary furniture and accessories, etc. as per specifications at Kakinada) (finalized during detail engineering).

The location may change; bidder shall take prior approval before execution of work. The cabling from the Telecom room to respective room / guard room to extend the telephones (4 pair 0.75 mm x cu telephones cable) shall be done. The phones have to be installed on the desktop at RT / DT location room and at SV/IP location; wall mounted on tray with proper dressing on cable tray. The distance between Telecom rooms/ guard room will be appx 30 mtr at each location however cabling work has to be done as per site requirement.

viii) CCTV System consisting of Network Video Recorders (NVR) server (with open architecture configuration having Camera Servers running Video Recording Software, Video Management Software, Video Motion Detection Software / Video Analytic Software etc), CCTV client work stations as define including software and storage minimum 40 TB (or **higher suitable** for at least 30 days backup data of all cameras of respective zone), Server shall be provided with 21"/22"screen alarm monitor and 60"screen for view with necessary equipments like Ethernet switches, Converter, Gateways, furniture and necessary accessories complete work as define above & in specifications. It has to be provided tentative at Kakinada and IP-3 cum Backup station.

Client Workstation shall be provided for System Administration / Management / Maintenance / Video Analytics etc along-with LED Monitors, Keyboards, Mouse, Joystick controllers / Mouse-Keyboard for PTZ Cameras. CCTV Cameras (PTZ type), CCTV Cameras (Fixed type) shall be FCC or CE and UL Certified with housing accessories, inbuilt (or external) IR, Mounting Arrangements and minimum one each for SVs, IPs, Despatch and Receiving Stations with necessary Converters, gate-ways, power and communication cabling / accessories shall be provided.

One PTZ and one fixed cameras shall be installed at each locations. In general the PTZ camera shall be installed on the roof top / building external wall with post & weather proof canopy to cover total area and the process area. The fixed camera shall be installed near the guard room to monitor the entry / exist of main gate. Camera licenses calculated as : quantity as per MR at respective zone plus mandatory spare plus 25% future provisions. Refer Annexure – XVI for deployment of equipments.

ix) Test Instruments as per the SOR shall be supplied as minimum requirements; **Lump-sum rate shall be quoted in SOR, however unit rate shall be provided with bid.**

x) Special Tools & Tackles required for the supplied system shall be arranged by the bidder for erection & commissioning.

xi) Mandatory Spare shall be supplied (for SDH, CCTV System with cameras, IP Exchange, Gateways, Video conferencing equipment) as minimum requirements as per SOR. (Bill of Material has to be provided along with offer, any fraction quantity should be round off to nearest number in higher side). **Unit rate for Mandatory spares with cards details, part no., make etc shall be given separately with the offer & price part.** Mandatory spare shall be calculated as per the clause define in this PJS.

xii) Dedicated Cu – Earthing, Surge protection for incoming power supply & lightening protection for indoor Telecom equipment shall be in vendor's scope.

xiii) Installation, Integration, Site Testing, Trial Run & Commissioning (including all supply of installation materials, accessories, connectors, Distribution boxes, MDF, cables {co-axial cable, multi-pair armoured & unarmoured telephone cables, Ethernet Cables}, pole {maximum 3-5 mtr} with shades & mounting arrangement for CCTV cameras, civil foundation for pole, Power testing of already laid 24 F OFC fiber, OFC connectors all work for SDH system, CCTV system, IP EPABX system, Video conferencing equipment & system, Leased lines, warranty, Post warranty Maintenance as per all other items / work not indicated here but required for completion of the system.)All the Rack /Panel should have anti- vibration pad, positive isolation from base channel, door switch & light (LED) & Name plate (all both front & back side) and minimum dimension of 2000 H x 800 W x 800 D mm with 100 mm base channel. The Server may have different dimension as per requirement, however hight must be of 2000 mm with 100 mm base channel.

xiv) All necessary works (minimum civil, trenching, backfilling including end to end power testing etc.) for Rectification & Restoration of already laid Optic Fibre Cable during trial run if required. Separate rate shall be quote as per SOR.

xv) Bidder shall quote for all the items. The offer will be evaluated on package basis. Commissioning spares as required has to be provided; a detail list of the commissioning spares shall be furnished along with the offer.

xvi) Bidder shall provide Channelling plan to include all the requirements of Telecommunication facilities specified in the tender for SDH, CCTV system & Cameras allocations, IP EPABX & various phones, Video conferencing, for SCADA LAN A & LAN B channel including all software and hardware to realise the system in totality.

xvii) Client will provide Power supply as specified for main equipment locations (IP/SV/RT/DT/consumer stations) as specified in respective section, further distribution and protection if any required shall be in the bidder's scope. All equipment shall be protected with all type of voltage fluctuations. Surge protection device for the power and communication shall be considered both internal and external type confirming to IEC or UL standards.

xviii) Video conferencing equipment and the system as per specification between Kakinada (MCS) & IP-3 cum backup station (BCS) shall be provided. Video conferencing equipment has to be installed in the conference room on wall with necessary connector and extensions from the SDH rack, documentations completely in all respect as per the specification shall be provided. Necessary furniture executive chair & suitable table (8 seaters) has to be provided.

Furniture (executive desk and execute chairs each sets for installation of three major system EPABX, CCTV NVR system, SDH NMS) at all locations. One network printer common for various systems, sub systems, equipment etc shall be supplied.

It is not the intent of Purchaser to specify every piece of equipment/item/ work but nevertheless any item / work not specifically mentioned but required as per Good Engineering Practice and for the safe & trouble free operation of the Telecom system deemed to have been specified & shall be in the scope of Bidder without any implication in the price or schedule. Any work required necessary to complete the interfacing during engineering / site installation commissioning shall be in bidder's scope. The quantities and the locations are likely to change, and shall be finalised during detailed engineering / execution. Bidder shall take prior approval before procurement or Installation from client / EIC.

2.3 SPARES:

Supply of Mandatory spares and Commissioning Spares of all supplied equipments shall be provided as per the following:

10% or min. two number (Whichever is higher) of electronic cards for SDH (STM-4 & 16 eqpt), Clocks, IP EPABX, Gateways, Switches, converters & Video conferencing equipment. CCTV cameras full equipment shall be consider as spare. **In case total installed cards are 1 or 2 then only one spare card shall be provided. Bill of material (with spare calculation) must be furnished along with offer.**

In addition to equipped spare cards/interfaces DC/AC or AC/DC converters & DC/DC Converter, Power supply for cameras, FXO gateway, FXS gateway equipment, chargers and any major items of the subsystem shall also be taken into accounting & considered during calculation of mandatory spares. **The above spares are not applicable for all Severs, motherboard, Telephones, monitor, LCT, CCTV NAS, WS, printer, Video Monitor & Camera. Spares shall be provided from the same manufacturing facilities/location from where the respective equipment, subsystems are offered.**

100 % spares shall be provided for consumables e.g. fuses, lamps, plugs, clamps etc. for SDH Equipments, EPABX system , CCTV Cameras & NVR systems, Video conferencing, DC/AC converter, consumable for Power systems etc.

For spares Vendor shall provide the address, contact person, fax and telephone numbers of the manufacturer for spare parts. The vendor shall warrant that spare part for the system would be available for minimum of 10 years after warranty period from the date of system commissioning. After this period if the vendor discontinues the production of the spare parts, then he shall give at least 12 months notice prior to such discontinuation so that Owner may order the requirements of spares in one lot.

The Vendor shall provide unit price of each Spare Module card, which shall be valid for the procurement of the spares for operation and maintenance in subsequent 10 years as & when requested or during detailed engineering.

a) COMMISSIONING SPARES:

The commissioning spares shall be arranged by the vendor to cater to the needs/requirement during installation, commissioning, site acceptance testing, trial run and warranty period. These spares shall be readily available with the vendor. If the spares not used they may be retained by the vendor for maintenance.

These commissioning spares are different from Mandatory spares and vendor shall not use mandatory spares as commissioning spares. Vendor shall provide a list of commissioning spares (with Serial & Part number for each system, sub-system) at the time of offer and it will be part of main offer.

3.0 QUALITY ASSURANCE PROGRAMME AND IMPLEMENTATION METHODOLOGY

- This shall include but not limited to preparation of detailed quality assurance programme, quality control parameters for equipment manufacturing and implementation of the systems, preparation of implementation methodology covering schedule of supply, installation, testing and commissioning. The Equipment/System design has to be approved by APGDC/PMC before actual manufacturing/supply of the equipment.

- APGDC/PMC shall carry out Factory Acceptance Test (FAT) for the offered system/equipment. Vendor shall make necessary arrangement for the testing of the same in presence of Owner's representatives before the dispatch of materials to the sites. Subsequently, vendor shall take up the installation and commissioning of the equipment / system at site.

- Upon successful completion of installation of the equipments / systems at sites, Site Acceptance Tests (SAT) shall be undertaken. SAT plan shall be proposed by vendor and approved by Engineer-in-charge. After successful completion of SAT of all supplied equipments/items, Test run shall be conducted.

- For FAT, SAT & Test Run, vendor shall also adhere to the instructions as specified under "Inspection & Testing Guidelines" mentioned below.

4.0 TEST CATEGORIES

The following tests (in the same sequence) shall be conducted for acceptance of the equipments and the system before final acceptance of the system.

1. Pre-Factory Acceptance Testing,
2. Factory acceptance Testing (FAT)
3. Integrated Factory Acceptance Testing (IFAT)
4. Pre-commissioning Test (after installation) for total integrated system.
5. Site Acceptance Testing. (SAT)
6. Trail Run.

4.1 INSPECTIONS AND TESTING GUIDELINES:

i. TEST PLAN :

For all types of inspection & testing under FAT, SAT & Test Run vendor shall prepare and submit Test Procedures & Plans to APGDC/PMC for their approval. The Test plans & procedures need to be submitted well in advance before the commencement of actual testing. The procedures/plans shall include time schedule for the tests, purpose/objective of test, test set-up schematic, required test equipment, identification of test inputs, test procedure and details of desired output/test result, a column for actual value obtained during the tests and remarks on test result.

ii. TEST REPORT:

The observations and tests results obtained during various tests shall be compiled and documented to produce Test reports by the Vendor.

The Test reports shall be prepared & submitted for each equipment/ item and the system. The report shall contain the following information as a minimum:

- Unit/Equipment under Test
- Test equipment used
- Test conducted.
- Test procedures.
- Test results.
- Remarks & comparison of tests results with the anticipated test result as given in test plans and reasons for deviations if any.

iii. APGDC and/ PMC or third party/agency (appointed by APGDC), reserve the right to inspect and test each equipment at manufacturing / supplier premises and at site during the installation & commissioning of the system. The inspection and testing shall include components, sub-assemblies, produced units for verifying and testing their guaranteed performance & specifications.

iv. It shall be explicitly understood that under no circumstances shall any approval of APGDC/PMC or his representative shall relieve the Vendor of his responsibility for material design, quality assurance and the guaranteed performance of the system and its constituents.

v. Vendor shall inform the owner, at least 7 days in advance of the date at which the system would be ready for Inspection & Testing. All relevant documents and manuals shall be submitted to APGDC /PMC before the time.

- Vendor shall arrange sufficient manpower of required skill and material for implementation of new equipment & associates systems/items at sites. All technical personnel assigned by the Vendor shall be fully conversant with the system specifications and requirements. They shall have the specific capability to make the system operative efficiently and shall also have capability to incorporate any minor modifications/ suggestions put forward by the owner.

- Till APGDC/PMC accepts the system, a log of each and every failure of components shall be maintained. It shall give the date and time of failure, description of failed component, circuit, module, component, effect of failure of component on the system/ equipment, cause of failure, date and time of repair, resolution of fault, mean time to resolution etc.

  If the malfunctions or failures of a unit/module/sub-system/equipment; repeat during the test, the test shall be terminated and Vendor shall replace the necessary component or module to correct the deficiency. Thereafter, the tests shall commence all over again from the start.

  If after the replacement, the equipment still fails to meet the specifications, Vendor shall replace the equipment with a new one and tests shall begin all over again.

  If a unit/sub-system/module has failed during the test, the test shall be suspended and restarted all over again only after the Vendor has placed the Equipment back into acceptable operation. Owner's approval shall be obtained for any allowable logistics time required to replace the failed component/unit/module/sub-system.

  Readjustments

  No adjustments shall be made to any equipment during the acceptance tests. If satisfactory test results cannot be obtained unless readjustments are made, Vendor shall carry out only those readjustment needed to ready the equipment/system for continuance of tests. A log of all such adjustments shall be kept giving date and time, equipment, module, circuit, adjustments, reasons, test result before and after adjustment etc. Fresh acceptance tests shall be conducted after the readjustments have been completed.

4.2 Pre Factory Acceptance Testing (FAT)

The vendor on his own exactly in line with approved FAT / IFAT shall conduct pre-factory acceptance testing and test reports for the same shall be forwarded to Owner/Engineer before start of IFAT/FAT.
Pre factory acceptance tests shall be carried out after review and approval of IFAT/FAT procedure/documents as per requirements.

4.3 FACTORY ACCEPTANCE TESTING (FAT):

Factory acceptance tests shall be carried out after review and approval of FAT procedure/documents as per tender requirements and review of Pre-Factory acceptance results & shall be conducted at the manufacturing/vendor's facilities.

The factory acceptance testing shall be conducted in the presence of the representative Owner. The tests shall be carried out on all individual systems/items including those supplied by Sub-vendors. After completion of FAT, factory acceptance certificates shall be issued. The FAT shall include but not be limited to:

(i) Equipment Testing:

- Mechanical checks to the equipment for dimensions, inner and outer supports, finishing, welds, hinges, terminal boards, connectors, cables, painting etc.
- Electrical checks including internal wiring, external connections to other equipment etc.
- Check for assuring compliance with standards mentioned in the specifications.
- Individual check on each module/sub-assembly as applicable
- Checks on power consumption and heat dissipation characteristics of various equipments
- Functional testing covering the features & functions of new systems/equipment along-with its associated items
- Any other test not included in FAT document but relevant to the project as desired by the Owner/Engineer at the time of factory acceptance testing.

(ii) System Integration Testing:

Functional and performance test of the all supplied systems/equipment under their respective integrated setup to provide required facilities/functionalities as per tender requirement shall be conducted as approved procedure of APGDC/PMC. The details of integrated setup will be finalized after the award of contract.

Following equipment shall be included as a minimum for FAT (by owner / Consultant) at **Manufactures works** where the material is actually manufactured & tested:- **All SDH equipments along with NMS.**

4.5 Integrated Factory Acceptance Testing (IFAT)

The vendor on his own exactly in line with individual FAT shall conduct integrated factory acceptance testing.

Integrated Factory acceptance tests shall be carried out after review and approval of IFAT/FAT procedure/documents as per requirements and review of PRE-Factory acceptance results & shall be conducted at the manufacturing facilities of SDH or Integration Centre or designated testing facilities having proven facilities to test all the equipments along with the manufacturer representative and the network as envisaged in any project.

The integrated factory acceptance testing shall be conducted in the presence of the Owner/Consultant. All OEM representative as required shall be present during inspection.

Following equipment shall be included as a minimum for IFAT (by owner / Consultant):-

I. All STM-4 & STM -16 equipments along with NMS.
II. All CCTV system along with NMS & cameras.

III. Clocks.
IV. All IP EPABX with Telephones
V. Video conferencing equipments

5.0 INSTALLATION, TESTING AND COMMISSIONING:

5.1 Installation

1) After successful completion of factory acceptance testing (FAT) of new equipments and associated items, they shall be sent to site for installation. Any equipment/associated item without factory acceptance certificates shall not be acceptable at site.

2) APGDC/PMC will provide dark fibre, space and power for installation and commissioning of new equipment along with associated systems/equipments at sites.

   Bidder shall also have to provide the site-wise Space & Power requirement for the offered system/equipment along with the bid document.

3) For the installation of supplied new equipment & associated items etc at site(s), the vendor shall carry out the following site preparation works as a minimum:

   - Installation & fixing of equipment rack / equipment (as per availably) for housing new equipment & associated items along with restoration of floors or walls after masonry or drilling works, as required.

   - Installation of suitable type of cable trays / conduits as required for routing, distribution & extension of various cables. These cable trays/conduits shall be installed / mounted suitably in vertical or horizontal planes keeping in view of the aesthetics of equipment room.

   - At unmanned/ manned locations power will provide in the electrical rooms adjacent to telecom rooms. Vendor shall supply, install, test & commission panel meeting the technical specification of tender document, at these un-manned locations in electrical rooms. Vendor shall carryout all required activity related to laying, routing, conducting, termination, dressing, saddling, hole-through in walls, labeling etc for extension of power cable from electrical rooms to telecom rooms at all sites. For extension of power cable minimum **4 core 2.5 sq.mm** armoured power cable (Cu) of appx. **25-30 meter** length per site shall be used by the vendor.

   - AC power at server locations, Power from Power Distribution Board to vendor supplied equipments & associated systems should be extended using 4.0 sq.mm armoured power cable.

   - All types of power cable termination and earth cable termination shall be carried out using copper lugs.
   - New earthing pit and earthing shall be provided.

   - Each system/equipment sub-rack shall be provided with Anti static wrist warp.

   - Suitable gland shall be provided for all cabling.

   - All types of cables shall be labelled on both ends for the identification.

4) Remote & Centralized Management of vendor supplied new equipment & associated telecom systems shall be provided at respective sites (Refer MR). For the same, the necessary supply, installation & commissioning of NMS system(s) [Hardware & Software] shall be carried out by the vendor at sites (within Telecom room) along with the extension & integration of management channel between SDH equipment at pipeline stations and NMS locations (at Sites). This job shall involve all the required cabling, routing, fixing, termination of new transmission equipment & NMS system(s) at site & required network integrating locations. For operation of NMS systems, APGDC will provide space & 230 VAC UPS power at sites.

5) For network synchronization of SDH network, Atomic Cesium Clock based Primary Reference Clock (PRC) at Kakinada & GPS based Secondary Reference Clock (SRC) at IP-3 cum Backup station and Synchronization Supply Unit (SSU) shall be provided.

6) The scope of work related new PRC system shall include but not limited to the following:

   (i) Supply, installation, integration & commissioning of new PRC clock meeting the technical specification of the tender.

   (ii) Supply & installation of software [in supplied Local Craft Terminal (LCT) of SDH equipment] for local management of all components of new PRC systems.

   (iii) Depending on the synchronization requirement in line with ITU-T recommendations for new SDH network will be deployed in network location(s) after detailed engineering by the vendor. The decision of location will be finalized by APGDC & vendor during engineering phase of the project after award of the contract.

7) As per the requirement of APGDC, vendor shall also integrate the new EPABX systems with existing APGDC EPABX systems over PRI link using APGDC provided E1 (2 Mbps), the details of which will be provided after the award of contract. Over these connected trunk lines, the subscribers of supplied EPABX system(s) should be able to establish reliable outgoing & incoming call sessions with the subscribers of all EPABX systems of APGDC.

8) CCTV & Video conferencing equipments and leased lines shall be installed as per the planning.

9) Before taking up the installation of new equipments & associated systems, the same shall be checked for completeness as per the specifications of the same as required for a particular station. Installation shall be carried out in accordance with the installation manuals and approved installation drawings in the best workmanship.

10) Vendor shall provide suitable numbers of manpower of required skills & technical expertise at his own cost for completing the work within the stipulated time frame.

11) Vendor shall bring all installation tools, accessories, special tools, spares parts etc. at his own cost as required for the successful completion of the job. Vendor shall include all installation materials required for proper installation of the new equipments & associated systems. These shall include but not be limited to, all connectors, inter-bay and inter equipment cables, power supply cables and connectors, power distribution boxes, anchoring bolts, nuts, screws, washers, main distribution frames, junction boxes etc.

12) The installation of equipments shall be done as to present neat and clean appearance in accordance with approved installation document drawings. All inter bay, power supply and other cables shall be routed through cable trays. No cable shall be visible. All through wall openings, trenches etc. shall be properly sealed to prevent the entry of rodents, insects and foreign materials.

13) If during installation and commissioning, any maintenance is undertaken, the maintenance spares supplied with new equipments & associated systems shall not be used for the maintenance. Vendor shall arrange his own spare parts for such activities till the system has been finally accepted by the Owner. A detailed report & log of all such maintenances shall be made available by the vendor to Owner/Engineer and shall include cause of faults and maintenance details.

14) A detailed time schedule for the activities to be undertaken shall be submitted by Vendor to Owner/Engineer to enable their representatives to be associated with the job.

5.2 Pre-Commissioning

1) Upon completion of the installation/erection of equipment, they shall be jointly inspected by Vendor & APGDC/ PMC representatives before start-up operations are undertaken. The correctness and completeness of the installation as per manufacturer's manual & approved installation documents shall be gauged leading to pre-commissioning activities at site.

2) Vendor shall carryout necessary provisioning/configuration/integration of newly installed SDH equipment/systems as per site-wise equipped configuration detailed at desired sites/locations and IP based EPABX systems, CCTV system & cameras and video conferencing system.

3) During pre-commissioning, if any fault occurs to any new equipment/associated system/item, vendor shall identify the same and provide report/history of all faults to the Owner.

4) During installation and pre-commissioning of the new equipments & associated systems, vendor shall have enough number of commissioning spares so that the installation is not held up because of non-availability of commissioning spares. Vendor shall ensure that the spares meant for operation and maintenance is not used during installation and commissioning.

5.3 SITE ACCEPTANCE TEST (SAT)

On completion of Pre-commissioning & integration of new equipment, the Site Acceptance Testing (SAT) shall be conducted by the vendor for the new equipments & network as per approved SAT procedure under the presence of Owner/Engineer.

For carrying out test/inspections & measurements during SAT, The vendor shall arrange all required calibrated test equipment / instruments, tools / tackles and skilled, trained & competent manpower.

SAT shall include but not be limited the following:

- Checks for proper installation as per the approved installation drawings for each equipment & associated systems/ items.
- Functional testing covering the features & functions of new equipments along-with its associated systems/ items to meet site specific requirements.
- Testing of supplied Spares modules / cards
- Any other test not included in SAT document but relevant for site operation

5.4 NETWORK STABILITY TEST

Upon completion of the site acceptance testing (SAT) of equipment & facilities at sites, Network Stability Test will be conducted for a continuous period of 72 hours. During this test end-to-end BER (Bit Error) Test will be conducted for new SDH networks of pipelines both at STM & Ethernet levels.

5.5 TRIAL RUN:

Upon successful completion of the Network Stability Test, vendor shall keep the all the supplied equipment & facilities including new SDH network, NMS, Network Clocks and associated systems of pipelines commissioned for 30 days for 'TRIAL RUN' to monitor them for 30 days from NMS and using SDH Analyzers & Ethernet Testers to meet performance objectives as per ITU-T recommendations: G.826 and G.821.

During this period, vendor shall provide all specialist Engineers & Technicians including experts at all NMS locations, so as to maintain the total log, incidents, failures & for assisting site engineer & for total co-ordination. However, the normal operation and maintenance of the system shall be performed by the personnel of the Owner trained for the purpose.

If during 'Trial run' any defect is noted in the system, the vendor shall rectify, replace the same to the satisfaction of APGDC. The decision to repeat the final test or restart the 'Trial' shall be of APGDC depending upon the severity of the defect.

During trial run, if any fault occurs to any equipment of system, vendor shall identify and rectify the same and provide report, history of all faults to the Owner.
Ideally, during the Trial run, no shutdown of the system due to failure of equipment should happen. A record of all failures shall be kept for each manned/unmanned station and the availability of the system shall be calculated and accordingly, results shall be submitted by the vendor to APGDC.

If the system fails to come up to the guaranteed performance, the Vendor, within a period of thirty (30) days shall take any and all corrective measures and resubmit the system for another 'Trial Run'. All modifications, changes, corrective measures, labour etc. shall be at the cost of the Vendor. In case the date of completion for the second trial run exceeds the time schedule for the project, he shall be liable to pay liquidated damages. If the system fails to reach the guaranteed performance even after the second trial run, the Owner shall be free to take any action as he deems fit against the Vendor and to bring the system to the guaranteed performance with the help of third party at the expense of the vendor.

5.6 COMMISSIONNING:

The new SDH network and associated equipment/system of pipelines shall be considered to be commissioned and taken over, only after successful completion of their Test run. However, the takeover by owner shall not be delayed for non completion of minor works and such jobs which do not affect the normal operation of the system, and such works/ jobs shall be completed by the vendor in accordance with the plan / schedule, which has been approved by the Engineer–In–charge. The date of successful completion of Test run shall be treated as the 'Completion Date' for such purpose as application of contractual provisions such as 'Price reduction schedule for delayed completion' etc.

5.7 SPECIAL TOOLS AND TACKLES

Vendor shall arrange the special tools and tackles for the commissioning and maintenance of the telecom system.

1. Special tools for SDH, EPABX, CCTV system, Video conferencing system, leased lines.
2. G.703 interface 120 ohms to 75 ohms converter/adapter.
3. OFC testing equipments

6.0 WARRANTY / EXTENDED WARRANTY /POST WARRANTY MAINTENANCE

6.1 The system shall be guaranteed to give specified performance of 99.99% for a period of 24 months (two years) from the date of acceptance of the system by the owner or 28 months from the actual delivery of material at site after FAT (date of material receipt at site) as per the terms & condition of contract. This warranty shall survive inspection of goods and acceptance of the system.

6.2 Bidder has to quote Extended Warranty **per month** (along with OEM). The Main warranty is for period of 24 months (two years) from the date of successful completion of trial run / acceptance of the system by the owner or 28 months from the actual delivery of material at site after IFAT) as per the terms & condition of contract and as define in clause no. 7.0 of PJS).

The extended warranty per month rate will be used to extend the main warranty for the delayed site work & handing over of system so that at the time of actual completion / handing over main warranty shall be available for 24 months. Period for extension will be for the site delay period only or will be finalised by the client as per the requirements and accordingly payments will be made as per SOR rate. Refer Clause no. 24.0 of Particular Job specification of the tender.

Contractor's engineers/ technicians, capable of trouble shooting & looking after the health of the system during the Warranty period/ Extended warranty, shall be made available all through the period of 24 months /12 months.

During the Warranty / Extended Warranty, the vendor shall use his own instrument, spares, man-hour, communication facilities, hardware, software, materials, etc. for the rectification of any problem.

6.3 WARRANTY / EXTENDED WARRANTY:

Contractor's engineers and technicians, capable of trouble shooting and looking after health of system during the warranty period, shall be made available all through the period.

Additionally the following shall also apply:

a) During the warranty, the vendor shall use his own instrument, spares, man-hour, communication facilities, hardware, software, materials, etc. for the rectification of any problem.

b) The "turnaround time" for the rectification of the problem shall be minimum. The owner envisages that the system, due to built in redundancies, shall always be operational. The owner shall be within his powers to impose penalty for complete break in communications system for more than the designed specifications. The same shall be discussed on award of work.
(Turnaround time: From the time of placement of first service call to vendor's representative until the system is restored fully to the satisfaction of the Owner.)

c) The vendor shall provide trained engineers and technicians on site during warranty maintenance.

d) The bidder shall be responsible for proper design, quality, workmanship & maintenance of all equipment, accessories etc. supplied by the bidder including all services, spares and consumables for a period of 24 months (warranty period) after taking over the system at site, for meeting the functionality and performance requirements of this contract. To fulfil the same, it shall be obligatory on the part of bidder to modify/upgrade, rectify any hardware problems in the system or replace any hardware from the supplied equipments and modify/upgrade, rectify the operating system software, Equipment software, other software, supply the required spares and consumables and attend to the troubleshooting & maintenance of the complete system, free of cost, during start up and on-line operation & maintenance of the system, within the Warranty period. Any modifications/ up gradation or replacement of any hardware & software during warranty shall not affect the performance & functionality of the system. In addition to this bidder will also have to carry out the updation/ change in setting based upon the input received from client or through their own analysis tools. To do corrections/ modifications/ diagnosis from remote, internet connection can be provided by client, if required.

e) The repair work should not however exceed 7 days otherwise warranty period shall be suitably extended.

f) After the successful completion of Trial run & successful performance testing, the PRE WARRANTY COMPLETION CERTIFICATE shall be issued by the COMPANY and there after Warranty phase will start.

g) As soon as the Warranty phase has been successfully completed and the bidder fulfils his obligation, he shall be eligible to apply for COMPLETION CERTIFICATE. The COMPANY shall issue to bidder the COMPLETION CERTIFICATE after receiving an application from bidder after verifying that works have been completed in accordance with the Contract Document.

h) The BIDDER shall warrant that the software are in good working order, is free of viruses, operates and performs properly on the hardware and network infrastructure. During the warranty period the BIDDER shall provide the following support for the software at no extra cost to the company.

- Technical assistance or consultation in order to assist the Company in solving problems encountered in the course of using the software.

- Timely correction of errors/defects in the software and system documentation.
- Provision of new releases of the software and/or documentation which incorporate solutions to all errors and/ or defects encountered in the use of the software or improvements to the software introduced by the BIDDER.
- Any additional support normally provided by the BIDDER to his customers during a warranty period.

6.4 In case of failure of any equipment, replacement is send immediately within 15 days. It is advice that Vendor should keep sufficient spare for warranty support in its stores (designated store to be informed during detailed engineering).

If the replacement is not send within specified time then penalty at the rate as define above or as define in contract has to be imposed. In case bidder still not responds then same may be deducted from the CPBG as per the terms and condition of the contract. Also vendor to provide firmware upgrades and configurator software upgrade free of cost to APGDC within warranty/extended warranty period.

6.5 System Warranty including all services and spares for operation and maintenance of the system.

6.6 POST WARRANTY MAINTENANCE CONTRACT – Comprehensive for 3 years

a) The Vendor shall quote for providing post warranty maintenance for 3 years (comprehensive for all supplied equipments) after completion of warranty /extended warranty period and provide technical support for the maintenance of the Telecommunication and associated system / subsystem including any repair / replacement of faulty cards/ equipments.
b) The proposal shall include travel, boarding & lodging of service engineer as and when required n case of site visit.
c) In the event of any malfunction of the system hardware/ system software, vendor will provide technical guidance to APGDC to resolve the issue with available spares with APGDC. In case the problem is not resolved through remote technical guidance then the vendor should sent experienced service engineer to site within 24 hours on the receipt of such information from owner and rectify the issue.
d) Owner personnel will work on system day to day basis and wherever possible, owner shall inform the type of failure of hardware/ software to vendor based on diagnostic available with the system. However Vendor shall be fully responsible to attend and rectify the root cause and the failure at the shortest possible time.
e) Vendor may utilize the spare modules available with owner if necessary and available with owner at site, which is part of mandatory spares supplied with system as per this contract. However the faulty card/equipment needs to be repaired / replaced by the Vendor within a reasonable time (not exceeding 2 months) to maintain bare minimum spares required for the system operation.
f) The service under Post Warranty Maintenance Contract , including repair/replacement of spare parts and services, shall broadly comprise of:
    a. 24 x 7 hr Technical Support for resolving issue /modification / upgradation of the system
    b. Repair/replacement of faulty parts.
    c. Emergency Service

The bid shall be made lumpsum for 3 years (comprehensive) and the price validity shall be available for the entire period of contract. Payments shall be made quarterly.

6.7 TECHNICAL SUPPORTS ON WARRANTY / POST WARRANTY

The details of services to be provided under warranty shall include but not limited to the following:

a) **TECHNICAL SUPPORT SERVICE**

Technical Support Services that extends coverage for APGDC after handover of the system. This includes 24 hours x 7 days a week on line support. APGDC shall utilize this service by intimating the Vendor of its unique customer ID in case of any contingency and Vendor in turn provide telephonic support. Depending upon the severity of the issue, engineer shall be sent by Vendor to the site. Vendor shall have service backup facility.

b) **DOCUMENTATION DELIVERY SERVICE**

Under Documentation delivery service Vendor is required to provide engineering practices and Technical Bulletins for updates at free of cost. All the latest software upgrades and updates for complete system are also required to be providing under warranty.

7.0 2 YEARS MANUFACTURER'S RECOMMENDED OPERATION & MAINTENANCE SPARES

Vendor shall attach a list of 2 years recommended operation & maintenance spares along with the unit rates on respective sub vendors letterheads, which would be necessary for 2 years trouble free operation and maintenance of the system after PWMC. The Owner shall be free to select the items of spares and the quantity at the time of award of contract or during the contractual period including PWMC.

2 year Operation & maintenance OEM suggestive spares, each module, with complete list, part no, unit rate shall be provided. The validity of rates shall upto contractual period including PWMC from date of commissioning / acceptance of complete work (i.e. 2 years warranty + 3 years PWMC- total 5 year) .

These spares are for the use of client after PWMC / or any breakdown during PWMC/ warranty / Extended warranty on replacement basis by the vendor on emergency.

Spares shall be provided from the same manufacturing facilities/location from where the respective equipment, subsystems are offered. Unit rates for each spares required for operation and maintenance shall be provided. Vendor shall provide the address, contact person, fax, and telephone number of the manufacturer of the spare parts. The Vendor shall warrant that spare parts for the system would be available for minimum of 10 years after warranty period after system commissioning (taking over). After this period if the Vendor discontinues the production of spare parts, then he shall give at least 24 months prior notice to such discontinuation so that Owner may order the requirements of spares in one Lot.

8.0 SUBMISSION OF COMPLIANCE REPORT

Vendor shall submit clause by clause compliance to the requirement of specifications with cross reference to the document submitted in the bid. The compliance form has to be submitted. Each of the pages shall be stamped and signed by the authorized representative of the vendor. Any of the clauses neither responded nor appropriately cross referred as per the submitted document shall be treated as Not Complied and liable for rejection.

9.0 GENERAL INFORMATION FOR PROJECT EXECUTION

Vendor shall arrange sufficient manpower and material for installation and commissioning of the network at all location.

9.1 TEMPORARY POWER SUPPLY

Vendor shall arrange for the temporary power supply during installation, testing and commissioning of the network.

9.2 UTILITIES POWER SUPPLY AVAILABILITY:

Client will provide UPS supply from Grid Power or Solar Power System at all station of the pipeline. UPS power supply shall be provided at one point within battery limit for the Telecom vendor. Telecom vendor provide and lay the cables upto Telecom equipments as per requirements & generate all other voltage levels if required. All necessary DC-DC and DC-AC converters and rectifiers shall be in the scope of vendor.

Necessary surge protection devices of suitable rating shall be provided for all incoming supply and communication channel. Station wise tentative power and maximum allowable load at each station is indicated in annexure XIV in details. The vendor shall indicate actual power requirement for the offered system. Please

note that from the DC rectifier unit, 48 V DC will be provided in the form of (+ - 48 V DC). Any positive isolation as required will be in telecom vendor scope. Refer Annexure – XIV for more details.

Cabling (shall be armoured FRLS) from the PDB / DCDB to telecom panel / sub units are in the bidder's scope. Surge protection device has to be provided for all incoming power supply to telecom equipment.

Dedicated separate Cu-Earthing along with dedicated earthing pit has to be provided by telecom vendor. APGDC shall provide the Telecom control Room having False Roofing and necessary trenching for installing the equipment. However on trench foundation channel as per the requirements of base frame of telecom panel has to be erected by telecom vendor. Necessary channel & welding work as required in the telecom vendor scope.

Bidder shall furnished power consumption details equipment wise / location wise at the time of bid/ detailed engineering.

Sl No	Station	Power Source	Power supply	Max. Allowable load (Watts)
1	Proposed Server locations Kakinada & IP-3	UPS (Grid)	230 V AC, 50 Hz 48 V DC	SDH server including WS: 1500 w CCTV server including WS:3500 w IP EPABX server :1000 w Video Conferencing : 1500 w 400 W for SDH, Cameras, phones, gateways and associated equipments
2	Despatch Station	UPS (Grid)	48 V DC	400 W for SDH, Cameras, phones, gateways and associated equipments
3	All Receiving station	UPS (Grid)	48 V DC	400 W for SDH, Cameras, phones, gateways and associated equipments
4	All SVs	Solar / (Grid)	48 V DC	300 W for SDH, Cameras, phones, gateways and associated equipments
5	All Stations of consumers	UPS (Grid)	48 V DC	400 W for SDH, Cameras, phones, gateways and associated equipments

9.3 SUPPLY AND STORAGE OF EQUIPMENT

This shall include but not limited to supply and storage of equipment and all other items required for installation and commissioning of the network including the following:

- Transportation of equipment and all other components from locations of manufacturing to Client's store and then to the locations of installation.
- Storage during transit & storage after installation till handing over to the Owner.
- Statutory clearances including clearances of Customs, Excise, Octroi and others, as required for all the supplied items.

9.4 SITE PREPARATION

This includes all electrical, civil works and site preparation activities at the equipment nodes along pipeline for installation and commissioning of the Telecommunication equipments including but not limited to:

- Preparation of Earthing Pit and providing Earthing for the equipments at the Equipment nodes.
- Upon completion of OFC laying activities by the OFC laying Contractor, the Telecom vendor shall take over the OFC after testing jointly with the laying contractor or the Client's nominated agency, witnessed by Client/ Consultant in line with the approved OFC Hop Test procedure.

- The telecom contractor shall be fully responsible for optical fibre communication, including cable for reliable operation of the communication system. All the necessary technical support during splicing and termination of OFC to FTC shall be provided to Telecom contractor to OFC Laying contractor for smooth working and handing over.

  All testing arrangements and equipments such as OTDR, Talk-set, Optical splicing machine, Optical Laser Source and Optical Power Meter, patch cord, pig tails for this testing and acceptance shall be made available by the Telecom vendor for end to end testing during handing over. For this the vendor shall make arrangements and come forward for acceptance of OFC links on notice from Client/ EIC.

ACCESSORIES / OTHER ASSOCIATED ITEMS

Procurement, supply and Installation of DDF/FDF / Telecom Equipment routine the fibres from FTC to FDF with a required length of Optical Fibre Cable and cabling between the Equipments and DDF's and all other items not indicated here but required for completion of the system shall be in the scope of the vendor.

Supply & Installation of necessary equipment, cables trays, cables & accessories to meet the overall system requirements along Natural Gas Pipeline, extension of telephone cables at respective sites, separate earthing & lighting protection of indoor telecom equipment at respective telecom locations etc.

Furniture (Desk/Executive chairs/Printer table) as required for various systems, sub-systems, equipment etc shall be supplied by the Vendor.

System integration including providing requisite interfaces and accessories to realize the complete system, which shall include but not limited to the following:

Integration of the optical transmission system with other subsystems, leased line network and the optical fibre cable (laid and terminated by other contractor), providing connectors, pigtails etc. to realize the complete optical fibre communication system in a redundant mode.

CCTV video surveillance system has to monitor the movement of personnel within the compound of all SV's stations and any other unmanned station along the route as per requirement of the owner.

Integration of IP phones from all sites to the EPABX for enabling switching of call wherever required.

Video conferencing equipments and system to be interface with SDH and commissioned at respective locations.

Leased lines as define has to be provide and connected to OFC network for seamless integration.

Supply of the Technical Literature, Drawings and Documentation for the complete system is in the Vendors scope.

Supply & installation of DC power Distribution Box (DCDB) with (N+1) spare capacity of 48 VDC power feed / terminations if specified for future use and complete wiring from the distribution box to the respective telecom equipments at telecom station as per specifications in the vendor scope.

The vendor shall extend the power from Client's provided power point to the DCDB, to be installed in the equipment room using the armoured DC cable. For the same, the DCDB and armoured cable & glands shall be supplied and installed by the vendor.

Any item of goods/services not specifically mentioned, but considered essential for completion of the work in all respects shall be deemed to be included in the scope of work of the successful Vendor.

9.5 SOURCE OF SUPPLY:

The Vendor shall source the supply of different equipments/ accessories as per the list of Source of Supply enclosed in the last of specification.

9.6 SYSTEM PROVENESS:

The SDH system, CCTV system, EPABX system, and its equipment offered will be the extension of existing proven system and Vendor shall responsible to meet the Proveness (combined or separately) as define in the existing system.

9.7 CERTIFICATE FOR LOGISTICS SUPPORT

Vendor shall provide backup engineering, maintenance support and spare part supports for a period of ten (10 years) for the system being supplied.

10.0 PACKING:

All equipments shall be individually packed in suitable containers/crates designed to avoid damage to the equipments during transit and storage in accordance with best commercial practice and with the requirements of applicable specifications. The material used for packaging, wrapping, sealing, moisture resistant barriers, corrosion preventers, etc. shall be of recognized brands and shall conform to best standards in the areas in which the articles are packed. The packing shall protect the equipment from impact, vibration, rough handling, rain, dust damp, insects, rodents etc. Each container/crate shall be subjected to impact, vibration and other mechanical tests. Each container shall be clearly marked with the following information at prominent places.

CLIENT	APGDC
PROJECT	NATURAL GAS PIPELINE PROJECT FOR APGDC pipelines
DESCRIPTION	
SERIAL OF EQUIPMENT	
P O NO.	
ADDRESS	

All equipments shall be tested for damage after their receipt at respective sites. If any equipment, part, subsystem, component, accessory is found to be damaged during the transit, the same shall be replaced by the Vendor, free of all costs to the Owner. The vendor shall replace such item as shall be indicated to him within 30 days of receipt of information.

11.0 TRAINING:

There shall be at least two training courses, one at vendor / manufacturer premises and another at site(s) when the system will be made operational. It shall be explicitly understood that owner's personnel shall be fully associated during engineering, installation, testing and commissioning activities and this opportunity shall be taken by Vendor to impart on the job training in addition to the two mentioned above.

Vendor shall provide comprehensive documentation, course materials, manuals, literature etc. as required for proper training of owner's personnel at his own cost. After the completion of the course, all such materials shall become the property of APGDC.

Training at Vendor/Factory Premises: Training on general functioning of supplied systems, card/module/sub-system wise details, system fault diagnosis / troubleshooting, upgradeability, add-on features and other relevant details shall be given at the factory site/vender premises at the expense of the Vendor. However, Travel & boarding charges of APGDC personnel during the training period at factory site/vender premises will be borne by APGDC.

Training at Site: Training to APGDC personnel on day-to-day operation, maintenance, local & remote monitoring, details of installed setup / configuration of equipment etc shall be provided at site.

Bidder shall train an agreed number of personnel of owner in all aspect of Telecommunication system. There shall be at least two training courses:

It shall be explicitly understood, however, that Owner's personnel shall be fully associated during Engineering, Installation, Testing and commissioning activities and this opportunity shall be taken by bidder to impart on-the-job training in addition to the two mentioned above. Bidder's offer shall exclude costs of transportation, lodging and boarding of the Trainees, which shall be arranged by the owner.

First Course: The bidders' quote shall include 10 days training at manufacturer's works/Integration Centre to be imparted by OEM of CCTV, SDH, IP EPABX, GATEWAYs, VC equipment with respective NMS. Number of owner's personnel shall be 5 persons each in two batches.

The first course to be conducted at the manufacturing facilities/Integration Centre shall be designed to train the trainees in all aspects of System Engineering, Equipment operation and functional details, theory of operation of equipment, trouble shooting and familiarization with the equipment at card and component level. All equipment used for training shall be identical to those supplied for site installation

Second course: The bidder quote shall include 6 days training at site for installed telecommunication equipment's (CCTV, SDH, IP EPABX, GATEWAYs, VC equipment with respective NMS). Training to be imparted by bidder and if required; OEM is also to be associated for training. Number of owner's personals shall be 3 persons each in two batches. The second course to be conducted at site, shall be mainly devoted to the operation of equipment and system including testing of equipment/sub-assembly, preventive breakdown, Trouble shooting and normal maintenance activities. The training imparted shall cover all aspects equipment incorporated in the system.

Bidder shall specify in his offer the types of courses he intends to impart, including but not limited to, the ones aforementioned.

Bidder shall provide comprehensive documentation, course material, manuals, literature etc. as required for proper training of personnel at his own cost. Consolidated and comprehensive documentation shall be available to each participant. After the completion of course, all such materials shall become the property of the owner. Bidder shall update the course material of manuals in case there are any changes owing to revisions/modifications in equipment/system specifications.

Bidder shall, Fifteen (15) days prior to start of training, send complete training program including details of each course, duration, subject matter, etc. The Owner/Engineer reserves their right to suggest any additions/deletion in the program, which shall be incorporated by the Bidder at no additional cost.

12.0 VENDOR DATA REQUIREMENT AND DOCUMENTATION

Documents shall be supplied as per Vendor Data Requirement. All documents shall be in English language only.

A) Documents to be submitted within One month.

- Project Schedule.
- Project Organization Chart.
- Quality Assurance program, Equipment & system test plans.
- Technical literature / data sheets / Information doc. of all major equipment to be supplied.
- Source of supply (SOS) with purchase order copy.
- Equipment schedule for various stations.
- Power Supply requirements at each station.
- Station-wise list of all equipments, components etc

B) **Documents to be submitted during detail engineering / Supply of materials:**

- System description, System configuration diagram & detail design concept for SDH products/solutions.
- Link connectivity diagram and proposed channelling plan. Detailed Network diagram for NMS of SDH elements. Detail Link engineering calculation based on Optical fibre characteristics & hop length

- Details technical manual of each type of equipment containing circuit diagram and description.
- Layout of equipments and space requirements for each station.
- List of special tools and tackles.
- Equipment interconnection diagram including details of various interfaces signalling protocols used at each stage.
- Power supply distribution, earthing arrangement and station wiring diagram.
- Cable layout drawings inside the building & requirement of all cable trays for each site.
- Installation manual giving manpower requirement, material requirement overall dimensions and weights of each equipment, installation procedure and commissioning.
- Tuning and field calibration procedure for each type of equipment.
- Supervisory configuration, alarm list, operate interface etc.
- Documents regarding accessories (DDF, Cabling between equipments & DDF'S) and other associated items.
- Maintenance manual of each type of equipment and for the entire telecommunication system.
- System description
- System configuration diagram
- Link Engineering of the network
- Link Connectivity diagram
- Station-wise Rack-layout
- Station-wise Bill of Material
- Station-wise Power requirement
- List of special tools and tackles
- List of mandatory spares
-

c) The following set of documents shall be supplied by the Vendor at all the manned stations and NMS centers (hard copy as well as soft copy).

- Details technical manual of each type of equipment containing circuit diagrams and description.
- Equipment schedule for various stations
- Equipment interconnection diagram including details of various interfaces, signaling protocols used at each stage.
- Layout of equipment and space requirements for each station.
- Cable layout drawings inside the buildings and requirement of all mounted cable trays for each site.
- Installation manual giving manpower requirement, material requirement overall dimensions and weights of each equipment, installation procedure and commissioning.
- Power supply distribution, earthing arrangement and station wiring diagram.
- Tuning and field calibration procedure for each type of equipment.
- Supervisory configuration, alarm list, operator interface etc.
- Maintenance manual of each type of equipment and for the entire telecommunication system.

d) The following set of documents shall be supplied by the Vendor at NMS centers (hard copy as well as soft copy).

- NMS Software (including Application and OS) in CD / DVD media along with Licenses
- LCT Software (including Application and OS) in CD / DVD media along with Licenses for each LCT set at respective locations.

The maintenance manual shall be divided into two sections as a minimum:

A) Preventive maintenance procedures

B) Trouble shooting procedures including failure analysis:

The section on repairs shall provide exhaustive information repairs including but not limited to removal, reinsertion of components and cards, repairs, adjustments, tuning, calibration, tools required for a particular operation, test points, including turn around time for repair and the details of the maintenance support service centre to be furnished in the bid and all other maintenance related details..

- Quality Assurance program, Equipment & system test plans.
- Expansion possibilities of the system without causing deterioration in the system performance.
- Any other data, document not specifically mentioned, but required for the satisfactory completion, operation and maintenance of the system shall be provided.
- Factory Acceptance test procedures.
- PRE-FAT test results

Documents to be supplied after FAT before start of installation:

- List of commissioning spares
- Site Acceptance Test procedures

Documents to be supplied after trial runs but before System commissioning (Final Acceptance of the System by Owner/Engineer):

STATIONS FOLDERS:

In addition to the six sets mentioned earlier, bidder shall supply 1 set of station folders at all telecom stations. The station folders shall include the following as a minimum:

Final system diagram description modification made as compared to system offered at bid stage, final wiring diagram system commissioning report, all the performance results of various equipments and for system as a whole for Test and Trial runs.

Details of the bandwidth available, details of hardware/ software required to utilize the bandwidth available along with details of the various cards, part nos. location from which the same can be procured with details of the contact person, fax, telephone nos. etc.

MAINTENANCE FOLDERS

In addition to the six sets mentioned earlier, bidder shall supply 1 set of maintenance folders at NOIDA projects sections. The maintenance folders shall include the following as a minimum:
Final modified equipment detailed catalogues, maintenance manual equipment tuning and calibration manual.

Circuit diagrams including component layout of all modules for each subsystem, equipment etc

STATION INVENTORY FOLDERS

In addition to the six sets mentioned earlier, bidder supply 1 set of station inventory folder at each telecom station. The station inventory folder shall include the following as a minimum (the exact quantity shall be documented and signed by bidder and countersigned by Owner/ Engineer.

- Station-wise list of all equipments, components etc.
- Spare part list.

The spare part list shall include the following as a minimum:

- List of spares available per station basis.
- Type of system (Optical, Microwave etc.)
- Name of equipment
- Description of Card
- Reference No.
- Name, Address & Contact Person of manufacturer & supplier
- Information regarding repair ability at factory/site.

Note:

In addition to the 6 sets hard copies, 6 sets of soft copies of the finalized document shall be provided in CD-ROMs before system commissioning (final acceptance of the system of Owner/ Engineer) as AS BUILT FINAL DOCUMENTS.(contents: Contract PO, FDS, FAT/ IFAT, IC, SAT, Manuals, Warranty/Guarantee, Site dwgs etc)

13.0 COMPLETION PERIOD

As per bid documents; refer Vol I of II of bid documents.

14.0 EQUIPMENT QUALIFICATION CRITERIA (EQC)- TECHNICAL:

The Telecommunication System (Internet Protocal - IP based) and various sub items such as SDH equipments, IP EPABX & Phones, CCTV system & Cameras, Video conferencing equipment etc required for APGDC pipeline proposed to be supplied shall be proven, from the existing range of respective manufacturer and should have successfully tested, installed & commissioned. The SDH equipment and NMS shall be proven and must have supplied & commissioned in hydrocarbon pipeline applications.

15.0 TECHNICAL SPECIFICATION FOR TELECOMMUNICATION SYSTEM (MEC/05/E5/APGDC/TS-97) (Enclosed separately)

Minimum details of Technical requirements has been covered in the Technical specification for Telecommunication system; Spec No: MEC/05/E5/APGDC/TS-97 Rev - 0); however bidder has to provide the best solution considering complete requirements as per the scope of work, PJS, TS, suggested Telecommunication network (enclosed as annexure X) and for the meeting of Voice and data requirements including leased line connectivity. The Technical specification for Telecommunication system; Spec No: MEC/05/E5/APGDC/TS-97 Rev- 0) is covering various sub-items; however it has to be read in conjunctions with MR, PJS, drawings and other documents enclosed with tender.

16.0 ANNEXURES

ANNEXURE – I to ANNEXURE – XVI (refer Index sheet)

****

ANDHRA PRADESH GAS
DISTRIBUTION CORPORATION LTD.,
HYDERABAD

TECHNICAL SPECIFICATION

FOR

TELECOMMUNICATION SYSTEMS

SPECIFICATION NO.: MEC/05/E5/APGDC/TS-097

PREPARED & ISSUED BY

INSTRUMENTATION & PROCESS CONTROL
(OIL & GAS SBU)
MECON LIMITED
(A Govt. of India Undertaking)
DELHI - 110092

Table of Contents

REVISION	ISSUE DATE	PREPARED BY	CHECKED BY	APPROVED BY
0	20.12.2016	(YASHIPRIYA)	(RATNADEEP GUPTA)	(PANKAJ SHIVASTAVA)

1.0 INTRODUCTION

1.1 OFC based SDH telecom equipment, IP EPABX system and Telephones with FXO/FXS Gateways, CCTV systems & Cameras (PTZ & Fixed); Video Conferencing Equipment, Leased lines from external service provider have been envisaged for APGDC Telecommunication requirements. Detailed scope will be as define in Material Requisitions (MR) & Particular Job Specification (PJS) of the bid.

1.2 The purpose of this specification is to define the outline requirement of dedicated Telecommunication Equipments.

1.3 In case of any conflict between the specifications, enclosed data sheets, enclosed attachments, related codes and standards, the same shall be informed at the bid stage, after award of contract change will not be permitted.

1.4 Vendor shall be responsible for selection of the correct system to meet the purchaser's specifications at the time of bid. In case of any modification / change in selected equipment model at a later date to meet the Purchaser's Specifications, the same shall be done by the vendor without any price and delivery implications.

2.0 DESIGN REQUIREMENTS OF TELECOMMUNICATION EQUIPMENTS:

2.1 ENVIRONMENTAL SPECIFICATIONS

All equipment shall be capable of maintaining the guaranteed performance with operational lifetime of 10 years minimum when operating continuously under the following environmental conditions:

1.	Temperature	Operate: For SDH Equipment, DC-DC Converter, FXO-FXS Voice Gateway, Phones: 0^0 to + 50^0 C (guaranteed) & up to + 55^0 C (degraded) For other equipment up to 0^0 to + 35^0 C (guaranteed) Storage: -10^0 C to +70^0 C
2.	Humidity	At any relative humidity up to 95% within the temperature range of 0 ^{0}C to 35^0 C
3.	Altitude	At any altitude up to 600m above sea level.
4.	Sand and Dust	The housing to be supplied along with the equipment should be in such a way that entry for dust, insect / rodent is totally prohibited.
5.	Tropicalisation	Shall be fully tropicalised with all cards & confirmally coated with lacquer.
6.	Shock and vibration	Shall withstand transportation and handling by air, sea and road under packed conditions.
7.	Salt, fog and mould	Shall withstand continuous usages in Marine growth environment.
8.	Electromagnetic	Shall meet the requirements as per IEC Compatibility-801.

2.2 SYSTEM / NETWORK DESIGN & ENGINEERING AND SITE-SURVEY:

The vendor shall be fully responsible and shall carryout detailed system/network design and engineering for implementation of new telecom systems for APGDC pipelines pipeline to provide Voice, SCADA & CCTV communication facilities required for pipeline operation, which shall include but not limited to the following:

i. Design & engineering of system/network would include/consider the following as a minimum:

- Study of proposed system (in PJS & TS), network topology & facilities.
- Gathering information through site-survey for complete system/network design & detailed engineering to meet the overall system availability objectives.
- Detailed design & engineering of SDH network involving SDH equipments, its NMS, DCN systems, FXO-FXS gateways, PRC etc taking in to consideration of the followings as a minimum:

➢ Optical link loss of network hops, guaranteed "End of Life (EOL)" parameters of optical Transmitter / Receiver of the offered SDH equipment and additional future optical link margin of 6 dB.

➢ Site-wise availability of space & power.

➢ Provision of station-wise equipped configuration of equipment.

➢ Provision of reliable connectivity for Pipeline Voice (for Watchman & Maintenance), SCADA & CCTV System facilities.

➢ New SDH network topology/architecture of APGDC pipelines.

➢ Seamless Integration of the vendor supplied SDH system/equipment & PRC with regard to Network management & Network Synchronization.

➢ Setting up of STM-16 (O) [1+1] link in layer-1 connecting to STM-4 (O) [1+0] link in layer-2 under APGDC SDH network in line with Telecommunication Network suggested as per **Annexure- X**.

STM-16 (O) [1+1] link in layer-1 will be formed connecting designated STM-16 Equipments with traffic interfaces as indicated under Annexure- X. For the same, necessary provisioning of optical amplifiers (booster amplifiers and pre-amplifiers as required), dispersion compensation etc as required to provide future optical link margin of 6 dB minimum. All these optical amplifiers, boosters and any other active opto-electronic units, which will be installed along with new STM-16 equipment (at those designated locations, preferably in the same chassis) for setting up STM-16 (O) [1+1] layer/tier, shall be from same OEM of SDH equipment and shall also be manageable from the new SDH NMS systems. To meet the link-engineering requirement, STM-16 equipment(s), with traffic interfaces as mentioned under Annexure- X can also be installed at intermediate STM-4/16 location(s) [as indicated under Annexure- X] between designated STM-16 locations. At all other remaining intermediate STM-4/16 locations [as indicated under Annexure-X], STM-4 equipment with traffic interfaces as mentioned under Annexure-X will be installed to form the STM-4 (O) [1+0] layer, which will be interconnected to the STM-16 (O) [1+1] layer**.**

- Detailed design & engineering of IP based EPABX systems, CCTV system of APGDC pipelines pipeline locations and its associated systems.
- Detailed design / engineering of all other supplies to meet the tender requirement.

ii. The vendor shall carryout site survey / inspection as required for design, engineering, installation, integration & commissioning of equipment at site by deploying its competent technical manpower and test/measuring equipment / instruments, tools & tackles. The mentioned site survey & inspection, measurements need to be undertaken following standard test / measurement procedures using calibrated test/measuring equipment / instrument by the vendor.

iii. The vendor shall prepare and submit the Network Design Basis document meeting APGDC's telecom facilities requirement immediately after the award of contract for approval of APGDC. As part of network design basis document, the engineering & design details like: Hop-wise Optical link engineering /budget calculations, SDH equipment setup for providing Voice, SCADA & CCTV system, space & power requirements for all supplied items, network synchronization, local & remote network management provisions, integration / interfacing to existing telecom system/network, station-wise equipment/cabling lay-out plan, system/network availability calculations, IP based EPABX system, CCTV system provisioning details etc are to be provided as a minimum.

The vendor shall be fully responsible for detailed engineering and design of the proposed system. The vendor shall design the network in a scalable fashion so as to support the future bandwidth and service needs. The vendor shall provide full details of the network design & engineering (all parameters) in the proposal with regard to following in line with Specifications, requirements & Design guidelines, given elsewhere in this document.

- Optical Link Engineering Hop-wise
- Network Management of SDH elements
- SCADA polling over IP based channel
- Network Synchronization
- Lease Line Network link engineering for all specified locations

The network shall be configured, equipped & integrated to ensure smooth & efficient operation of SCADA system including facilities like Voice, Data and CCTV Surveillance system.

2.3 DESIGN GUIDELINES FOR TELECOMUNICATION EQUIPMENTS:

1. The system design shall be flexible enough to meet future expansion program up to the maximum capacity of each system and sub-system without deteriorating the performance of the system.

2. In general, specifications provided throughout this document shall apply. In case of conflict more stringent specifications shall override specifications given elsewhere and decision of the Owner/Engineer in all such cases shall be final.

3. The optical and multiplexing equipment should be able to work continuously in non air-conditioned environment (guaranteed performance) under prevailing environmental conditions of the sites.

4. All venting, cooling shall be natural. However, in case of equipment internal forced cooling with suitable dust filters may be used, if required.

5. All equipments shall have sufficient number of alarms and supervisory indications and shall be provided with self-diagnostic facilities. All alarms and monitoring & diagnostic facilities shall be built-in & shall be displayed on the front panel of the equipments for ease of maintenance. It shall be displayed on the front panel of the equipments for ease of maintenance. It shall be possible to transmit these indicators, parameters to the control stations/NMS.

a. The point shall be available on the front panel for system monitoring and easy fault-location.
b. The healthy condition of the units shall be displayed by green LED's, unhealthy condition by red LEDs.
c. All-important switches shall be provided with controls on the front panel with suitable safeguard to avoid accidental operation. Manual changeover should be performed by more than one Sequential operating procedure to avoid accidental operation.

6. The equipments shall be fully based solid-state technology. The system hardware shall be modular to have flexibility to meet any demand for expansion or modification with minimum changes.

7. All equipments shall be immune to EMI, RFI interferences generated by any nearby source & shall meet the latest international standards in this regard.

8. The equipments shall be capable of functioning with minimum maintenance and shall be preferred to have no requirement of any preventive maintenance.

9. All PCBs used shall be glass epoxy type and shall not chip owing to repeated soldering/de-soldering. The PCBs shall not warp on any account.

10. All wiring-including field interconnection wiring shall be cabled and clamped to the chassis. The wiring shall follow standard color-code. All patch cords shall be provided with connectors matching to the cable used and shall have identification markings.

11. All sub-assemblies or modules, switches and controls and the circuit components shall be so mounted as to permit their replacement without appreciable disturbance to other components.

12. Vendor to specify the power requirement of the offered Telecom system at each telecom station.

13. If the vendor is not using distributed power supply system on individual module basis then the Power Supply cards shall be duplicated (1+1). However, one standalone power supply card shall be able to run the system for its entire lifetime & there shall be sharing of load between the two power supply cards under normal conditions.

14. Racks for all the equipment of individual system, sub-system shall be provided from the reputed manufacturers only and they shall adhere to all the quality norms.

15. The equipment construction should be such that it does not allow ingress or entry of rodents, insects, and dust. For this, equipment should be suitably sealed from all sides, top and bottom.

16. All the special tools and tackles, etc. shall be procured and supplied as a package with its carrying cases, accessories (interconnecting cables, connectors, lamps, batteries, fuses etc.) for their respective manufacturer.

17. Termination for all used interfaces shall be provided with 100% spares capacity.

18. All equipment racks, housings shall be provided with antistatic wristbands.

19. The nodes (stations) should be hitless i.e. removing or inserting plug-in-units must not affect the existing traffic on the other unit.

20. The configuration of the nodes should be easily expanded by adding plug-in-units and modifying software settings

21. It is required that the laser transmitter is automatically shut down when the incoming signal is missing.

22. Upon completion of OFC laying and termination activities by the OFC laying Contractor, the vendor shall take over the OFC link after testing jointly with the laying contractor or Client's nominated agency, witnessed by Client/ Consultant in line with the approved OFC Hop Test procedure. Vendor shall restore OFC after taking over till completion of trial run. Telecom Vendor shall guide OFC contractor during splicing and termination of OFC at FTC as per the proposed approved channelling plan.

23. Vendor shall be totally responsible for the completion of the project. Owner/Engineer reserves the right to modify, revise and alter the specifications of equipments and systems prior to acceptance of any offer. System requirements may be modified after selection of successful vendor to meet operational requirements not envisaged at the time of selection of Vendor.

24. Owner/Engineer reserves the right to modify the system requirements till such time the system is ready for final acceptance. Vendor shall undertake to meet the revised requirements without any financial implication to the Owner provided to additional equipments of selection as required.

25. In case at the time of implementation there is any change in the network design & configuration to meet the owner's operational requirements, the vendor shall undertake all the activities such as design, manufacturer, supply, Installation, etc. of additional equipment hardware and software for which additional financial implication, if any, shall be approved by the owner on the basis of sufficient details and justifications being provided by the vendor.

26. If during the course of execution of the work any discrepancy or inconsistency, error or omission in any of the provisions of the contract is discovered, the same shall be referred to the Owner/Engineer who shall give his decision in the matter and issue instruction directing the manner in which the work is to be carried out. The decision of the Owner/Engineer shall be final and conclusive and the Vendor shall carry out the work in accordance thereof.

27. The Vendor to give full documentary proof of satisfactory worked of the system.

28. The supplier shall provide link engineering for the configuration offered, taking fibre distance to be 5% higher than the physical distances indicated in the network drawing. Following are the guidelines for the link engineering calculations for pipeline.

A	Attenuation in fibre	0.22 dB/Km for 1550 nm or 0.37 dB/Km for 1310 nm
B	Splice loss	0.1dB per splice and splices at every 2km in building the OFC link in each span/Hop
C	Connector Loss	0.5 dB per connector for 4 connectors per link
D	Required Future Margin	(-) 6 dB per link for STM 4
E	Cable plant Repair margin	2 dB per link

Vendor to provide details of link budget calculations as part of his bid, for each hop with end of life worst-case figures as per ITU-T. Operating wavelength (optical) shall be 1550 nm.

30. Equipment Panels shall be free standing and conform to minimum IP 42 requirement. The panels shall have lockable front and rear doors and bottom cable entry and provided with gasket and fitting to keep out moisture, salt, dust, greases and corrosives. The panel shall be naturally cooled.

    All doors, drawers, trays and other weight supporting parts shall be fabricated of metal and adequately reinforced to limit vibrations. All components and devices inside the panel shall be well highly and the panel shall have a tidy look.

    The equipment cabinet (Rittal or equivalent) to be supplied shall be constructed to allow free airflow to dissipate heat generated. Construction shall be such that ventilation grills will not be obstructed when equipment is mounted in its installed position. In order to effectively remove dissipated heat from the cabinets, vent louvers backed by wire fly screen shall be provided. Vendor shall calculate the heat dissipation and where the calculations prove the necessity, then air flow ventilation shall be assisted by integral low power silent running air extraction fans and same shall be included in vendor's scope. In let ventilation grills shall be filled with dust filters.

    The Vendor shall guarantee satisfactory functioning of the system hardware mounted in the panels even in the event of failure of air-conditioning unit.

    Hardware mounted and wired panels of all systems included in the scope of the Vendor shall be subjected to burn-in operation for minimum 15 days before dispatch to site.

    The cabinet shall be made of CRCA sheet enclosures frame minimum thickness shall be 1.5 mm and the cabinet size 2000 mm height x 800 mm width and 800 mm depth and 100 mm base frame. Gland plate thickness shall be 3.0 mm.

    Power supply separate feeder for Cooling fans, panel door switches, space heater, maintenance socket and Tube lights front & rear end shall be provided.

Finish

i. All frame and steel work of the cabinets shall be degreased, then phosphate treated or coated with primer, followed by at least two undercoats
ii. All the cabinets shall have 'Nameplates' correlating with the type and location of the cabinet at both side front & back.
iii. The color shall be RAL 7035 Gray for external and for internal RAL 9001 Pale cream inside the cabinet. (It will be finalized in detailed engineering)

2.4 ENGINEERING REQUIREMENTS

The equipment shall be fully solid state and adopt state of the art technology. The equipment shall be compact and in composite construction and light weight. The manufacturer shall furnish the actual dimensions and weight of the equipment.

All connectors shall, be reliable and of standard type of ensure failure free operation over long periods and under specified environmental conditions. All connectors and the cable used shall be of low lost type and suitably shielded.

The equipment shall be housed in standard 19" rack, or ETSI rack and with front access. The equipment shall have natural cooling arrangement; use of forced cooling is allowed provided:

- The Fan failure is reported to LCT as well as NMS.
- Multiple fans are there in one tray with hot standby redundancy.
- Fans are DC operated.
- MTBF for fan is better than 60,000 hours.

The plug-in units shall be suitable type to allow their removal/insertion while the equipment is in energized condition. The mechanical design and construction of each card/unit shall be inherently robust and rigid under all conditions of operation, adjustment, replacement and storage.

Each sub-assembly shall be clearly marked with schematic reference to show its function, so that it is identifiable from the layout diagram in the handbook. Each terminal block and individual tags shall be numbered suitably with clear identification code and shall correspond to the associated wiring drawings.

All controls, switched, indicators, etc. shall be clearly marked to show their circuit diagrams and functions.

2.5 MAINTENANCE REQUIREMENTS

Maintenance philosophy is to replace faulty units/subsystems after quick online analysis through monitoring sockets and alarm indications. The actual repair will be undertaken at centralized repair centres. The corrective measures at site shall involve replacement of fault units/subsystems.

The equipment shall have easy access for servicing and maintenance. Extension of degraded paths to test access point for diagnostic work after traffic is switched over to the healthy path should be provided.

Suitable alarms shall be provided for identification of faults in the system and faulty units. Suitable potential free contacts should be provided for extension of summary alarms.

As and when bugs found/determined in the software, the manufacturer will provide patches/firmware replacement if involved free of cost for three years. Modified documentation (hard copies and soft copies) wherever applicable shall also be supplied free of cost. Ratings and types of fuses used are to be indicated by the supplier.

2.6 POWER SUPPLY

The power supply provided for telecommunication system at respective station as define load refer the respective clause of Particular Job specification. Vendor shall select the equipments accordingly. Any AC to DC or DC to DC or DC to AC converter for other voltage if required will be in Vendor's scope. Power supply / Converters cards shall be of N+1 configuration.

Nominal power supply is with a variation over the range of 20 %, the equipment shall operate over this range without any degradation in performance. Power shall be provided at one point, further cabling and distribution is in the Vendor's scope.

The power consumption shall be minimal. However, station-wise maximum allowable power consumption is indicate in above respective Clause. The actual power consumption has to be furnished by the manufacturer during detailed engineering.

The derived DC voltages in the equipment shall have protection against over voltage, short circuit and overload.

2.7 EQUIPMENT SAFETY AND PROTECTION REQUIREMENTS

The equipment shall have a terminal for grounding the rack. Protection against short circuit/open circuit in the accessible points shall be provided.

All switched/controls on front panel shall have suitable safeguards against accidental operations. The equipment shall be adequately safeguarded to prevent entry of dust, insects and lizards.

- OPTICAL SAFETY REQUIREMENTS

All optical interfaces should comply to optical safety standards as mentioned elsewhere in the technical specification.

- OPERATING PERSONNEL SAFETY REQUIREMENTS

The operating personnel should be protected against shock hazards as per IS-8437 (1993) "Guide on the effects of current passing through the human body" (equivalent to IEC publication 479-1-1984).

2.8 ELECTROMAGNETIC COMPATIBILITY (EMC)

The equipment shall conform to the EMC requirements as per the following standards and limits indicated therein:

Conducted and Radiated Emissions – To comply with class A [for low capacity (below 34 Mbps data rate)] of C ISPR 22 (1993). "Limits and methods of measurement of radio disturbance characteristics of information Technology Equipment"

Electrostatic Discharge

To comply with IEC 1000-4-2 "Testing and measurement techniques of Electrostatic discharge immunity test" under following test levels

- Contact discharge level 2 (+ 4 KV)
- Air Discharge level 3 (+ 8 KV)

Fast transient common mode burst

To comply with IEC 100-4-4 "Testing and measurement techniques of electrical fast transient/burst immunity test" under level 2 (1 KV for DC power lines: 1 KV for signal control lines)

Immunity

IEC 1000-4-3 "Radiated RF electromagnetic field immunity test" Under Test level 2(Test field strength of 3 V/m)

Surges Common and differential mode

To comply with IEC-4-6 "Immunity to conducted disturbances" indicated by radio frequency field."

2.9 EARTHING SYSTEM

- Standard: IS 3043-1966 or equivalent BIS & IEC standard
- The earthing material to be used shall be Electrolytic Copper having the material specifications confirming to the IS standards.
- The dimension of the Earthing strip, which shall be connected between Earth pit & the equipment or the earthing distributor, shall not be less than 25 mm X 5 mm
- The earthing pit should have water-pouring facility.
- Earthing resistance should be less than 2 ohms or should be suitable for the equipment to which the earthing is extended.
- For approval shall be taken for all drawings and the distributions up to equipment from Engineers In charge.

3.0 TECHNICAL SPECIFICATION OF TELECOMMUNICATIONS EQUIPMENTS

3.1 SDH (STM- 4 & 16) Equipment Specifications:

The SDH System should be a carrier grade multi-service platform and should be able to support whole new breed of functionalities for efficiently aggregating, switching and managing a mix of global services ranging from applicable optical SDH services and Layer-2 Ethernet services.

The SDH System should be equipped with a fully non–blocking Cross Connect Switch Matrix. The equipment-wise Total & Lower Order (LO) level switch matrix capacities in a single shelf shall be as mentioned in Table. The equipment should provide cross connect at all VC-n [VC12, VC-2, VC-3, VC-4 & VC4-nC (n=4 &16)] levels. Complete Switch Matrix including HO & LO should be 1+1 protected.

The Switch Matrix shall be completely non-blocking Trib-to-Trib, Line–to–Line, Trib-to-Line and Line-to-Trib connections at Lower Order (LO) or / and Higher Order (HO) levels without any restrictions or limitations as per the requirement.

The platform should full fill the objective of setting up a capable, integrated high capacity backbone with capability to support a variety of service needs as specified in this document.

The equipment shall provide Virtual Concatenation facility / feature [at VC12, VC-3, VC-4 & VCn-Xv levels] for Ethernet traffic provisioning. Also the equipment shall have LCAS feature to enable dynamic allocation of bandwidth.

The offered Equipment shall use SFP modules for all Optical Interfaces.

Provision for suitable potential free contacts should be provided for extension of external alarms to NMS.

EQUIPMENT PROTECTION

- All the traffic affecting common and control units shall be 1+1 protected, which essentially includes Switch Matrix, Synchronization/Timing Unit and Power Supply modules. Any other Controller hardware should also be protected in case its failure disrupts/affects traffic. For replacement of any faulty Controller hardware in the equipment with good one, removal/insertion of plug-in units shall be possible in energized/ powered on condition of the equipment and shall not affect the operational traffic.

- For a particular type of SDH equipment, each type of protected common & control hardware units/modules shall be of same type/model.

- The Controller Module/Card (say “Management Controller”) responsible for local & remote management from NMS and for storing NE management data/information (like: ID, Address, DCN information etc) of SDH equipment shall preferably be 1+1 protected.

  In case, the said Management Controller is not 1+1 protected and its fault resolution by the replacement of faulty controller with spare one (having default/no configuration) in the energized / live / in-service condition of the equipment is traffic affecting, the vendor shall facilitate Maintenance base locations with suitable facilities, systems, sub-systems etc for configuration/programming of spare Management Controller module, so that the configured spare module can be put into operation in place of faulty one in the affected equipment without affecting/disrupting its traffic.

NETWORK TOPOLOGY

The SDH equipment should support various network topologies as listed below:

- Multiple Rings
- Star
- Meshed-rings
- Point-to-Point
- Linear Chains.

The equipment should support all possible topology requirements and should be capable of being configured as a Terminal, ADM, Regen or DXC. The Regen and ADM should be expandable to equip multiple tributary / line interfaces.

NETWORK PROTECTION

The equipment should be configurable for both protected as well as unprotected services. The equipment shall have following traffic protection provisions at all VC-n (VC12, VC-2, VC-3 & VC-4) levels for all its traffic interfaces:

1. Sub-Network Connection Protection (SNCP)
2. 1 + 1 Multiplex Section Protection (MSP)

In addition to above protection, offered SDH equipment shall also meet the requirement of traffic protection wherein the continuity of traffic between traffic end points with availability of any single continued path between those end points via new equipment over multiple segments.

The equipment shall also support sub 50ms switching mechanisms for Layer-2 Ethernet traffic through implementation of schemes like RPR/ERPS etc.

INTERFACE FEATURES AND CAPABILITY:

a) Optical interfaces:

- The SDH equipment shall support applicable STM-1, STM-4 and STM-16 optical interfaces in the same platform compliant with latest ITU-T SDH specifications.
- The STM-1(O) /4 (O) /16 (O) ports of offered SDH equipment shall have broadband / white-band receiver, which will accept and operate with corresponding STM-N frame over optical signal of both 1310 nm and 1550 nm wavelengths.
- For Optical SDH interface, which will be used for a link as indicated for which optical link loss has been provided mention below, the interface type (long-haul / short haul operating @ 1310 nm/1550 nm) will be determined considering the associated optical link loss, its guaranteed "End of Life (EOL)" parameters of optical Transmitter / Receiver and additional future optical link margin of 6 dB. Other equipped optical SDH interfaces shall be of minimum Long-Haul (LH) type (@ 1550 nm).

b) Electrical Interfaces:

The SDH equipment shall support E1, E-3, DS-3 & STM-1E interfaces in the same platform having the following features:

a. E1 interfaces:

- Shall be as per ITU-T G.703, G.704 specifications.
- Shall support 120 ohm balanced interfaces.

b. E3 (34 Mbps) & DS-3 (45 Mbps) interfaces

- Shall be as per ITU-T G.703, G.704 specifications.
- E3 and DS-3 interfaces shall be supported

c. STM-1E interface as ITU-T specifications

c) Ethernet Interfaces & Services:

- The SDH equipment shall provide Fast Ethernet electrical interface and Gigabit Ethernet optical interface. The FE & GE ports shall be provided using Electrical (10/100 Base-T, RJ-45 connector) & Optical interfaces (1000 Base LX @1310 nm over Single Mode fibre pair) respectively.

- 10Base-T, 100Base-Tx & 1000Base-LX shall be complied with IEEE 802.3, 802.3u & 802.3z respectively.

- All Ethernet interfaces shall support QoS functionality in compliance to IEEE 802.1p.

- The equipment shall support virtual concatenation of multiple VC-n signals for Ethernet circuits (n = 12, 3, 4) and shall provide rate limiting in steps of 2 Mbps to maximum port speed, Auto sensing, half/full duplex negotiation.

- The Ethernet interface must use the Generic Framing Procedure (GFP) according to ITU-T G.7041 and the Link Capacity Adjustment Scheme (LCAS) according to G.7042, as well as virtual concatenation.

- The equipment shall provide Layer-2 Ethernet services for provisioning of Point to Point, Point to Multipoint and Multipoint to Multipoint LAN configuration (EPL, EVPL, EPLAN, EVPLAN), Layer 2 aggregation, VLAN tagging complying to IEEE & MEF standards.

- The Ethernet interface must use the Generic Framing Procedure (GFP) according to ITU-T G.7041 and the Link Capacity Adjustment Scheme (LCAS) according to G.7042, as well as virtual concatenation.

- The equipment shall have IGMP Snooping features to effectively handle the multicast Layer-2 Ethernet traffic, so that the spread of the multicast data on layer 2 network can be prevented efficiently without choking the backbone capacity.

SYNCRONIZATION:

SDH equipment shall be able to synchronize from the respective new Synchronization sources to be supplied under this project. Vendor shall synchronize the new network by deriving the network clock. Other clocks as required shall be provided as per ITU – T recommendation.

The SDH equipment should have a minimum one Input & minimum one output Synch Interfaces. The SDH equipment should provide a 2MHz clock from the system.

The equipment should be capable to synchronize from:

a) External clock b) Any STM-N c) Internal clock.

The synchronization shall be as per the following specifications:

a) Compliance with ITU-T G.813 standard for clock accuracy.
b) Compliance with ITU-T G.811, G.812 and G.813 standards for minimum free-run accuracy, SDH jitter and wander and holdover stability

EMBEDDED MANAGEMENT CHANNEL

The SDH equipment should be managed from NMS by using embedded DCC bytes of SDH frame as prescribed in the frame structure for SDH in ITU-T. Any external DCN equipment required should be clearly indicated with a connectivity plan.

DCC TRANSPERENCY

The SDH equipment shall provide DCC transparency to enable the passing of the DCC channels (DCC-R & DCC-M) of other Vendor's SDH system over any optical interfaces.

ELEMENT MANAGEMENT FUNCTIONALITY

The SDH system / Network Element (NE) shall be managed locally & remotely by Local Craft Terminal (LCT) and remotely by central Network Management System (NMS) through standard interface in line with ITU-T standards. Local management interface of the equipment shall be of RS-232 / Ethernet type.

Any single NMS shall be able to manage all the new SDH systems/NEs, which will be supplied under this project, irrespective of their management areas/subnets. However, LCT shall be able to manage any new SDH system/NE, minimum one at a time, having the same management area/subnet as that of the NE to which LCT will be physically connected.

To ensure reliable NMS connectivity to SDH system in the network, there shall be provision of dual-homed connectivity of each NMS to two Gateway NEs (GNEs) [in automatic protected manner] in a network segment having management reach-ability to all NEs in that segment. Failure of one GNE shall not affect the manageability of SDH equipment of that network segment from NMS systems. In case of total loss of NMS connectivity to a SDH equipment, the same shall continue to provide the services without any deterioration.

All the data pertaining to configuration, cross-connections, administration, performance, security, operation and maintenance of the equipment in the network shall reside in its non-volatile memory and shall enable for FCAPS management functions of the equipment from NMS and LCT. The required software/firmware shall be pre-loaded and configured in all SDH equipments as per site requirement before dispatch from factory.

The software download to the equipment shall be possible online without interrupting the traffic. The system should also have smooth and non-disruptive up gradation in case of software up gradation.

The remote manageability of the offered equipment from NMS systems, facility of management channel over TU12/E1 shall be provided in addition to the manageability via embedded SDH OH DCC/POH bytes, as prescribed in the frame structure of SDH in ITU-T. Remote node manageability using Dial-up Modem is not acceptable.

TEST AND MEASUREMENT FACILITIES:

- SDH equipment shall have following Test / Diagnostic loop facilities:

  For all SDH & PDH ports, diagnostic loop facility on both Equipment (Remote) and Interface (Local) sides shall be provided.

  Here the following definition Equipment & Interface diagnostic loop shall be applicable:

  Equipment (Remote) Loop: Test loop for the card – the outgoing signal is looped back directly into the port.

  Interface (Local) Loop: Test loop for interface – the interface port shall enable looping back of the incoming signal directly.

  The activation and de-activation of the diagnostic loop on the ports can be done from NMS and LCT.

  An alarm must be raised if a diagnostic loop is active.

- Receive Optical Power Measurement:

  Receive Optical Power measurement provision for all optical interfaces should be available for the equipment, which can be read by accessing the equipment through NMS.

OPTICAL SAFETY

All optical Interfaces must fulfill the latest version of ITU-T standards and recommendation including the following minimum requirements

- Automatic laser shutdown (ALS) shall be implemented
- Optical connection ports and optical source devices shall be marked with warning labels. A facility is required to prevent hazard to personnel due to the escape laser radiation from a ruptured cable or uncoupled connector.

INTER-OPERABILITY

All the Optical and Electrical interfaces of SDH equipment shall be able to seamlessly integrate and inter-operate with the APGDC's other OEM SDH equipment.

CABLES & CONNECTORS

As per the equipped Optical and Electrical Interfaces, the Contractor shall supply various cables in line with following:

- Optical Patch-cords:

  Optical patch cords [Length = 20 meter (min.)] for each port (TX and RX) of the equipped optical interface in the equipment, compatible with the existing FDF of the location.
- E-1 Cable with Krone DDF:

  For the equipped E-1 interfaces, the Vendor shall provide E-1 cable [Length = 3.5 meter (min.)] terminated in Krone DDF. The DDF shall have two parts, namely:

Equipment side (for connecting to equipment port) and Field side (for connecting to User equipment). Hence, total terminations in the DDF should be double of equipped E-1 ports in the equipment.

- Ethernet Cable:

  Ethernet patch cable [Length = 20 meter (min.)] for all equipped Electrical & Optical Ethernet interfaces.

SDH EQUIPMENT CONFIGURATION:

- **Equipment Capacity:** Category-wise Equipment Capacity in respect of providing maximum numbers of various type of traffic interfaces without addition / upgradation of common & control modules (like: Switch Matrix, Synchronization/Timing unit, and Power Supply modules etc) and sub-rack/motherboard of SDH equipment are as given below:

Equipment Type	Maximum Traffic Interfaces in a single equipment, meeting all Technical Specifications of Tender document (Note -1)						Cross-Connect (LO)
	STM-16 (O)	STM-16 (O)/ STM-4 (O)	STM-1 (O)	E-1	FE	GbE	
STM-16	4	4	4	21	16	4	20G

Equipment Type	Maximum Traffic Interfaces in a single equipment, meeting all Technical Specifications of Tender document (Note -1)						Cross-Connect (LO)
	STM-4 (O)	STM-4 (O)/ STM-1 (O)	STM-1 (O)	E-1	FE	GbE	
STM-4	4	4	4	21	8	0	2.5 G

It shall be possible to equip the above-mentioned STM-4 & STM-16 equipments with traffic interfaces up to the capacity mentioned in above table for carrying traffic up to the maximum interface rate/speed of individual traffic interfaces/ports in non-blocking manner.

Note 1:

All the STM- 16 & STM - 4 equipment in terms of supporting various interfaces shall be as per above as minimum in a single self except STM-16 (O), the STM-4 (O) shall be as per the present requirement suggested in proposed Telecommunication network Annexure – X; at any interface node present requirements with spare (25 % or minimum 2 nos) as required has to be considered while designing/ selecting the equipments.

- **Populating/Equipping of Hardware Modules/Units** in SDH equipment shall be done following guidelines mentioned below**:**

o STM-4, STM-1, DS-3, E-1, Ethernet tributary traffic interfaces shall not be considered / used from the module having STM-16 interface in STM-16 equipment.

o STM-1, DS-3, E-1, Ethernet traffic tributary interfaces shall not be considered / used from the module having STM-4 interface in STM-4 equipment.

o For a particular type of SDH equipment, each type of protected common & control hardware units/modules shall be of same type/model.

o Each type of optical STM-N & Ethernet interface shall be equipped using minimum two nos. of same type/model hardware modules/units in the offered equipments for all sites.

- In STM-16 Equipment, Ethernet module should have minimum 16 numbers of WAN ports for getting assigned to Ethernet ports to establish Point to Point, Point to Multipoint and Multipoint to Multipoint Ethernet LAN configuration (EPL, EVPL, EPLAN, EVPLAN).

- In STM-4 Equipment, Ethernet module should have minimum 8 numbers of WAN ports for getting assigned to Ethernet ports to establish Point to Point, Point to Multipoint and Multipoint to Multipoint Ethernet LAN configuration (EPL, EVPL, EPLAN, EVPLAN).

- In case, it is not possible to equip the entire equipment in a single main-chassis; the use of only a single expansion-chassis, provided through extended system backplane, shall be permitted. There shall be neither cross-connections performed in the expansion–chassis nor any control-card housed therein.

- **Equipped Configuration:** The equipments at various locations shall be equipped and configured as per suggested network **Annexure-X** with respect to traffic interfaces and Cross-connect switch-matrix.

- **Software / Firmware Version:** The software / firmware version of the SDH equipment shall be latest & proven one and shall be same for each type of offered models.

STANDARDS COMPLIANCE FOR SDH EQUIPMENT:

The SDH equipment must full fill the latest version of ITU-T, ETSI & ISO standards and recommendation including the following minimum requirements:

Requirement		**Recommendation**
a) Functional Characteristics:		
Functional		G-692, G-958, G.781, G-782, G-783, G-784
b) Transmission interface characteristics:		
b1)	Optical Fibre Cable	G-652
b2)	Optical interface	G-707, G-957
	b2.1) Output jitter (all optical interface)	G-783, G-823, G-825, G-958
	b2.2) Jitter tolerance(all optical interface)	G-823, G825, G-958
	b2.3) Jitter transfer function (all optical interface)	G-783
b3)	Electrical SDH interface	G-707, G-703
	b3.1) Output jitter	G-823
	b3.2) Jotter Tolerance	G-823
b4)	Mapping and de-mapping	G-707
b5)	SOH insertion and extraction	G-707, G-783
b6)	Pointer generation and interpretation	G-707, G-783
b7)	Multiplexing	G-707
	b7.1) Synchronous frame structure	G-704
b8)	Scrambling and De-scrambling	G-707

c) Synchronization interface characteristics:

c1)	Synchronization interfaces	G-703, G-81s
c2)	Selections	G-783, G-81s
c3)	Output jitter	G-703, G-81s

d) Management interface characteristics:

d1)	Synchronization digital Hierarchy	G-784
d2)	Management	M-3010
d3)	Interface	Q3

e) Other Engineering requirements:

e1)	Equipment practice	ETS 300 119
e2)	Electro-magnetic compatibility requirement	ETS 300 386-1
e3)	Storage	ETS 300 119-1-1,Class 1.2
e4)	Transportation	ETS 300 119-1-2,Class 2.3
e5)	Stationary use at weather protected location	ETS 300 019-1-3, Class 3.2 (with high air temperature of +50 deg-C)
e6)	Power supply	ETS 300 132
e7)	Earthing	ETS 300 253

e8) Ethernet standards for all products with Ethernet interfaces

- IEEE 802.1ad-IEEE Standard for Local and Metropolitan Area Networks---Virtual Bridged Local Area Networks
- IEEE 802.1p/q-VLAN Tagging
- IEEE 802.3-10BaseT
- IEEE 802.3ab-1000BaseT
- IEEE 802.3ah-Ethernet OAM
- IEEE 802.3u-100BaseTX
- IEEE 802.3x -Flow Control
- IEEE 802.3z-1000BaseSX/LX
- IEEE 802.1D-Spanning Tree

F) POWER SUPPLY REQUIREMENT:

SDH equipment shall work on (–) 48V DC supply (Nominal) with the provision of dual supply inputs and shall meet the following requirements:

Nominal power supply is (–) 48 Volts DC with a variation over the range (–) 40V to (–) 60V. The equipment shall operate over this range without any degradation in performance.

Types of fuses used in the equipment are to be indicated along with their ratings and 100% spares for the same shall be supplied by the vendor along with the equipment.

The equipment shall be adequately protected in case of voltage variation beyond the range specified above and also against input reverse polarity. The derived DC voltages in the equipment shall also have protection against over voltage, short circuit and overload.

The power consumption shall be minimal. However, station-wise maximum allowable power consumption is indicated in **Annexure-XIV** The actual power consumption is to be furnished by the Vendor.

G) PERFORMANCE REQUIREMENTS

The SDH equipment shall provide no errors for 48 hours on any channel at reference receive level (nominal level).

H) **SYSTEM RELIABILITY / AVAILABILITY:**

The system availability should be greater than 99.99% [excluding logistics, fibre and power supply provided by others]. BER shall not exceed $1^* 10^{-12}$ for any traffic interface of the SDH equipment.

REMOTE & CENTRALIZED MANAGEMENT OF SDH EQUIPMENT /NETWORK:

New SDH equipment supplied & installed by the vendors APGDC pipelines shall be remotely managed from NMS systems in line with following:

1. For SDH network of APGDC pipelines:

There will be one NMS systems which will be installed at Kakinada for APGDC pipelines. NMS systems shall have all capabilities and configurations with regard to network management functions.

Vendor shall plan and supply all necessary DCN hardware and software and implement DCN connectivity so as to have the manageability of all the supplied SDH elements independently from NMS at Kakinada even during OFC link cut in APGDC pipelines pipeline network or in event of total collapse of the NMS system & its associated DCN infrastructure.

Under multiple OFC cut conditions in a section, some of the SDH network elements (NE) may get isolated from NMS systems. However, after restoration of link, all the active alarms of the isolated NEs shall be unloaded automatically in the active NMS.

There will be one additional Client Work station shall also be installed at IP station -3 cum backup station in APGDC pipelines having its integration with NMS system of Main NMS of APGDC pipelines.

Accordingly, vendor shall plan and supply all necessary DCN hardware and software and implement DCN connectivity.

A) <u>SYSTEM DESCRIPTION:</u>

The Network Management Systems shall be for the ultimate capacity of the offered SDH equipment.

The Network management system shall be of open architecture and the NMS shall have built-in supervisory facilities for monitoring the health of various stations automatically. Data from various stations shall be available at both the Network Management systems and shall monitor and control all stations.

Network management system should typically include:

(i) <u>Automatic Fault Management:</u>

(a) Conforms to ITU-T Rec. G.784
(b) Generation, recording and displaying of network alarm information and notifications with all details (type, occurrence, severity, probable cause and clearing etc.);
(c) Localization of alarm-raising anomalies / faults;
(d) Storing and processing of alarm information upto the unit/module level;
(e) Storing and processing of historical alarm log for minimum 30 days with all relevant details.

(ii) Configuration Management:

(a) Conforms to ITU-T Rec. G.783 and G.784
(b) Creation of Network Element (NE) in Network Management / Network Editor domain;
(c) NE Configuration;
(d) Creation, updation, deletion and retrieval of the managed network topology data;
(e) Assignment of equipment protection w.r.t. the unit/modules and selection of protection switching;
(f) Configuration of various error/fault/alarm generation threshold;
(g) Configuration and management of NE / network synchronization;
(h) Configuration and management of NE's Cross-connect matrices, end-to-end PDH/SDH/Ethernet trails and assigning network resources to the trail, enabling/disabling of protection switching of trails;
(i) Configuration & management of features like: VCAT, LCAS, GFP etc.;
(j) Automatic End to End Ethernet Traffic management for EPL, EVPL, EPLAN, EVPLAN;
(k) Management of DCC configuration etc.

(iii) Performance Management:

(a) Conforms to ITU-T Recs. M.2100, M.2101, M.2120, G.783, G.784, G.821, G.826, G.828 and G.829;
(b) Continuous monitoring of performance of each trail over fix time period of 15 minutes and 24 hours. For bi-directional trail, the performance monitoring shall be performed separately for each direction by using concept of near-end and far- end to indicate the performance of each of the transport. For each trail, performance and availability event shall be monitored for NES (Near-end Error Second), NBBE (Near-end Background Block Error), NUAS (Near-end Unavailability Second), NSES (Near-end Severe Error Second), FES (Far-end Error Second), FBBE (Far-end Background Block Error), FSES (Far-end Severe Error Second), FUAS (Far-end Unavailable Second) etc and 15-minutes & 24-hours reports to be generated;
(c) Reporting of Ethernet link performance;
(d) Reporting the performance and availability history of any trail as required.

(iv) Security Management:

(a) Providing protection to network resources and services from unauthorized access through maintaining the user database which contains their password and their related authorization levels. Only the

system administrator has the authorization to access and edit the user information;

(b) Allowing only the user with a correct username and a valid password to access and perform any management functions;

(c) Monitoring of the login and logout activities of the system and record such activities as a sequence event. Every login and logout activity shall be recorded in a log file with information such as username, login and logout time and successfulness of login attempt. The information in the log file shall be retrievable and browse-able by the system administrator;

(d) Creation of a new user group, a new user and assigning of limit rights to manage any particular NEs and any management capabilities to any specific user or user group as required, by the administrator;

(e) Aging of password and restriction of duplicate logon.

(v) Software management:

(a) Loading and installation of new system software or software patches with display of message regarding the progress, successful or failed operation;

(b) Local or Remote Software Download (with appropriate user authorization) through FTP / TFTP with display of message regarding the progress, successful or failed operation;

(c) Managing different & multiple versions of software.

(vi) Inventory management:

(a) Showing inventory based on the available device inventory;

(b) Providing the complete view of the network elements and the interconnecting links;

(c) Keeping track on any change in the network inventory;

(d) Indicating absence/presence of any physical module/hardware and also indicating the usage of module.

The each Network Management System (NMS) setup/infrastructure at Kakinadaof APGDC pipelines shall include but not limited to the following:

- NMS Server (Hardware, Firmware & Software) with Monitor, Key-board, Mouse etc with configuration as a minimum shall be installed.

- NMS Client Workstation (Hardware, Firmware & Software) along with 21-inch LCD Monitor, Key-board, Mouse, etc. with configuration as a minimum shall be installed in Network Monitoring area (away from NMS server area).

- DCN equipment (Hardware, Firmware & Software), which will be installed in Equipment room / area of Rajahmundry.

All the databases in NMS Server should have disk mirroring/ standby configuration. External backup of Network Management databases through Tape Cartridge / CD / DVD / Flash Memory should also be provided (this should have both options of manual & scheduled backup). The restoration of the backed-up data to NMS server should be done from external backup media (Tape Cartridge / CD / DVD / Flash Memory) directly without any further conversion or transfer to other media.

All the hardware of NMS systems should be provided from proven and reputed sources.

All SDH equipment shall be manageable through a single application Platform. Collection and data base storage in the NMS should be fully automatic. Operation for NMS should be pre-emptive (i.e. in case of any wrong operation the system software should not crash) and Should provide control and robustness for database backup and download by supporting database target verification to prevent the use of a wrong database.

This management platform will provide network topology view (graphical and textural) of all the SDH elements and alarm log.
Management data (Q3 interface) shall be carried between SDH nodes by the DCC (Data Communication Channel) bytes of STM SOH.

The management platform should have graphical user interface and the graphical view of the network elements should offer a quasi-photographic picture at the highest level, going down to block diagram views of the functional blocks i.e. the network management system shall graphically depict the entire network in a single global view.

From this view the following should be accessible.

a) The topology level- shall display in the main window and shall be the background for all other management views.
b) The NE shelf view –shall show the internal physical layout of the NE's i.e. the various cards installed in their slots.

Throughout all presentation layers, continuous alarm information should propagate. For all views and tasks, a context sensitive on line help should be provided. In addition, complete product documentation should be accessible via the online help system.

The routing protocol shall be dynamic and in accordance to ITU-T standard protocols, required for Network management. Updates of routing tables should be automatic.

Vendor to provide details of the NMS provided including details of hardware and software utilized and also how the network management can be expanded if the network grows (state addressing rules, action required limits of network (size, etc.).

B) CONFIGURATION

It should be possible to read the configuration from the network elements into a file, make the desired changes in to the file and restore the configuration into the network element, thus providing a way of saving the configuration of a network in the NMS for backup purposes.

C) USER ACCESS

It should be possible to connect two NMS or one NMS and one local craft terminal (hand held service terminal /lap top computer) to the network at the same time.

The user name should define the access right for the system as per defined user privilege class.

The different user privileges available shall be as follow:

Allowed Action	Operator	Experienced user	Network Administrator	System Administrator
Display network file	Yes	Yes	Yes	Yes
Enable profile monitoring	No	Yes	Yes	Yes

Create new profile	No	Yes	Yes	Yes
Create new network maps	No	No	Yes	Yes
Create new network files	No	No	Yes	Yes
Purge historical alarms	Yes	Yes	Yes	Yes
Install communication drivers	No	No	No	Yes
Configure drivers	No	No	No	Yes

D) INTERFACE TO HIGHER LEVEL MANAGEMENT SYSTEM

Vendor is required to provide details of such interfaces.

E) FEATURES / FACILITIES:

1. End-to-end Trail creation for both TDM & Ethernet circuits by pointing the start of the trail to the end point of the trail automatically.
2. Multiple views of layered topology.
3. Unified management of different transport layers.
4. Multilayer service provisioning.
5. Evolving TMN functionalities including fault management, performance monitoring, equipment configuration and administration, transmission and connectivity management and system and authorization control features.
6. Open CORBA interfaces towards the TMN upwards.
7. The network management system should be capable of managing both the optical platform and transport network simultaneously through the versatile network manager. The comprehensive management system should provide maximum integration and full modularity.
8. The network management system should have free flow of management information between the SDH and other complimentary access without regard to their source of manufacture. It should support data communication channel (DCC) hardware transparency and allow the creation of DCC path for the transfer of third party management information through the network element and sub networks. The NMS shall be provided with CORBA interface for Integration with the other vendor's NMS on a common platform.
9. The network management system should deliver end-to-end management.
10. The NMS Operating System (OS) should be based on either licensed UNIX or LINUX or MS-Windows with all Anti-Virus provisioning. The NMS software should be user friendly. During warranty period, the anti-virus software shall be upgraded/updated on regular basis in systems by the vendor without any cost implication to client.
11. The NMS should have the capability of managing minimum double the numbers of SDH elements which would be implemented under this project without any software & hardware upgradation of supplied NMS system. Here, all network elements are to be considered to have been upgraded to its maximum capacity.

12. It should be in compliance to ITU-T recommendations.

13. The hardware should be provided from proven sources.

14. Printer interface support in the NMS shall be provided for printing the following as a minimum:

    i) Time, date and alarm
    ii) Type of alarm
    iii) Name of station
    iv) Time, date of alarm reset
    v) Severity, Status of alarm

15. Alarm reporting interfaces: Real time screen display, both graphical & textual for alarm occurring at any station without need for logging into the particular station.

16. The management system shall also provide audible alarms (with a provision to disable the same, as and when required by Owner), whenever a new alarm enters the management log. Reminder function sound visible blinking shall be available whenever unacknowledged alarms are present in the system. Alarm export to a remote location should be possible in future (without any additional software). Suitable port for the same shall be provided.

17. Alarm categories:

    - Critical
    - Major
    - Minor
    - Warning
    - Cleared or Acknowledged

18. All details of the alarms shall be coming automatically and directly without any human intervention. All alarms (time, date of alarm, Type of alarm. Name of Station, Time, date of alarm reset etc.) shall come discretely at the NMSs, with all details, for each of the above categories (no summed alarms).

    Fault message storage : To be stored in a database.

    Maximum number of records to be stored: Vendor to provide the upper limit of storage of records.

    House keeping of the database:

    When the database gets near to the maximum number of records set at the installation, an alarm should be produced for the user. In case database gets filled up, following should be available. A tool for selectively deleting records is to be provided with the NMS. For backups, tools should be provided. In case the user does not delete/clear records, first In first out (FIFO) principle shall apply.

    The user interface should have separate alarm lists for new, acknowledged and cleared alarms. A separate dialogue should be available for analyzing the historical alarms.

F) PERFORMANCE DATA

The performance data should be available for each network element.

Performance monitoring should be available according to ITU-T

Two separate records for last 15 minutes and 24 hour records shall be available. Performance monitoring shall be possible to set on all above functional blocks, including history records.

G) BACKUP

Back-up provision shall include but not limited to the following:

- Fault data
- Performance data
- Configuration data
- Cross-connection data
- NMS System data

H) LOCAL CRAFT TERMINAL (LCT)

LCT (Local Craft Terminal) [Hardware & Software] along with associated items like: cable, connectors, licensed software shall be provided for local & remote management of supplied SDH equipment.

The LCT hardware shall be provided form proven sources (hand held service terminal equipment of manufacture/ Laptop computer from reputed along with licensed operating system (OS).

The minimum configuration is mentioned as:

LCT Hardware Configuration

The hardware of the proposed LCT shall be high reliability personal computer (PC) supplied by a proven Laptop Computer manufacturer.

The minimum requirement of each remote terminal shall be as follows:

- Intel 2nd Generation Core-i5 processor
- Licensed MS Window with Anti Virus provisioning
- 8GB DDR-3 1333 MHz SDRAM
- 500 GB hard drive
- DVD+/-RW
- 14-inch LCD monitor with a resolution of 1366X768
- Ethernet 10/100 adapter with RJ-45 connector
- Minimum 4 hours Battery Life
- USB/RS-232 Serial Interface

NMS Server Hardware Configuration

(A) If the proposed SDH management system hardware platform is RISC-based servers, the successful bidder shall provide at least a high performance and high Reliability RISC-based computer which shall be able to operate in multitasking and multiprogramming mode.

The minimum requirement of the each server shall be as follows:

- Quad-core Processors, clock speed at least 2.0 GHz or better
- 16 GB RAM
- 2x146 GB hard drive with redundant configuration
- 21-inch LCD monitor with a resolution of at least 1,024×768.
- DVD-ROM
- Mouse and keyboard
- 2xEthernet 10/100/1000 adapter with RJ-45 connector

(B) If the proposed SDH management system hardware platform is a CISC-based Servers, the successful bidder shall provide high performance and high reliability Server supplied by a well-known proven Server Manufacturer (OEM).

The minimum requirement of each PC is as follows:

- Quad Core Xeon 2.0 GHz or better
- 16 GB RAM
- 2x146 GB hard drive with redundant configuration
- 21-inch LCD monitor with a resolution of at least 1,024×768.
- DVD ROM
- Mouse and keyboard
- 2xEthernet 10/100/1000 adapter with RJ-45 connector

NMS Client Workstation Hardware Configuration

The hardware of the proposed NMS Client Workstation shall be high reliability personal computer (PC) supplied by a proven PC manufacturer.

The minimum requirement of each remote terminal shall be as follows:

- Intel 2nd Generation Core-i7 processor
- Licensed MS Window with Anti Virus provisioning or Linux
- 8GB DDR-3 1333 MHz SDRAM
- 500 GB hard drive
- DVD+/-RW
- 21-inch LCD monitor with a resolution of 1920X1080
- USB Mouse and keyboard
- Ethernet 10/100 adapter with RJ-45 connector

3.2 PRIMARY REFERENCE CLOCK (PRC):

The PRC system shall consist of following as a minimum:

i) Atomic Cesium clock based Primary Reference Source (PRS) with minimum 10 years warranty shall be provided. A Cesium clock shall provide minimum 4 x redundant outputs of 2 MHz driving directly from the unit. An external distributor shall not be accepted. The specifications of Cesium clock shall be as per respective clause.

ii) An SSU with built-in GPS module shall be offered. The GPS shall act as back-up to Cesium. The SSU must have capability to equip 2nd GPS module whenever APGDC wants to upgrade it for future requirement. The SSU must provide fully redundant configuration including 1:1 module protection for; Input Card, Holdover module (1st module as Rubidium and protection module as XO), Output Card and Power Supply Card. The SSU must provide minimum 04 x protected outputs of 2MHz. The SSU should be upgradable to ensure proper synchronization of NGN networks, whenever needed by APGDC at later date. The specifications of SSU shall be as per respective clause.

iii) The GPS module shall be provided with complete GPS Antenna Kit including Lightning Protection Kit and GPS Cable.

iv) ETSI/19" Rack of reputed make for housing all above PRC components.

v) Software for local management of above mentioned components of PRC system, which can be installed and made operational in supplied Local Craft Terminals (LCT) of SDH equipment under this project.

Primary Reference Source (Atomic Cesium Clock)

- The Primary Reference Source (PRS) should be an Atomic Cesium Clock suitable as a timing source for a Primary Reference Clock exceeding ITU-T G.811 for telecommunications networks.
- It should support Digital Cesium Oscillator technology with automatic microprocessor control.
- The Warranty of the Cesium tube should be minimum 10 years.
- The Primary Reference Source should have Frequency Accuracy better than +/- 5.0 x 10E-12.
- The Cesium clock should be offered with 4 x 2MHz redundant outputs. It is important that the redundancy is offered through separate module (1:1) within the Cesium unit.
- All modules of the PRS should be replaceable in a hot condition, i.e. when the equipment is powered up and in use.
- The Outputs should be offered with 75 Ohms BNC connector interface.
- It should have provision to automatically squelch individual outputs due to failure in the Cesium tube.
- It should provide a standard management interface for equipment management. The Remote control and monitoring should be via RS-232 or 10/100 Base-T Ethernet Interface.
- The PRS should provide comprehensive alarm reporting and remote monitoring capabilities.
- The Atomic Cesium clock should have a Monitoring and Alarm Controller card which should concentrates shelf alarms and provides visual indicators as well as relay contacts for in-station monitoring.
- The PRS should remain fully operative even if the management module is absent.
- It should be supplied in ETSI type Sub-rack. All connectors must be on the front panel.
- Input Power Supply: The PRS must be equipped with two DC power supply inputs. The power supply voltage range should be 40VDC to 60VDC.
- Power Supply Units (PSU) of PRS should operate in 1+1 hot standby protection mode. The failure or removal of one PSU should not affect the function of the Primary Reference Source.

Synchronization Supply Unit (SSU) with built in GPS module

- The SSU should be NGN ready for maximum flexibility. There should be provision of Auto detection of redundant card function and firmware version. The SSU should have Ports for the addition of Expansion Shelves for increased number of outputs.
- The SSU must supports Synchronization Status Messaging (SSM) on input and output interfaces E1 (2.048 Mbit/s) according to ITU-T G.781 second generation SSM norms.

- The SSU should have convenient front access connectors and plug in cards with optimised grouping of functionalities.

- **Redundancy / Protection**: All cards shall be duplicated for full system redundancy from the inputs to the user outputs. Duplicating the cards for full system redundancy does not impact on the maximum input or output capacity of the SSU.

- **Inputs:** SSU must accept 4 (Four) Selectable 1:1 Protected Inputs (E1 / MHz). The SSU with Unprotected Inputs shall not be permitted. The SSU must monitors, measures and calculates performances of every single input connected to its inputs, as well as the GPS line input line.

- **Input Qualification/Selection Criteria:**

  The unit must have following criteria that causes input change over:
  LOS, LFA, AIS, ER

  It should have three possible input selection modes i.e.
  a) Automatic: It is based on user defined priority table
  b) Automatic: It is based on SSM & user defined priority table
  c) Manual mode

- Jitter & Wander filtering should strictly be according to G.823 & G.825.

- The accuracy of internal clock oscillator should exceed ITU-T G.812.

- It must have life more than 15 years and shall not require any adjustment, calibration or maintenance throughout its lifetime.

- MTBF should be more than 16 years.

- It must have Pulling Range (peak to peak) of >6.0 x 10E-7.

- The short-term stability should be 1.0 x 10E-11 (0.2 –10s).

  The maximum output phase changeover after channel changeover should be less than 10ns (typically 5ns), with hitless switching.

- **GPS Input:** The SSU must have capacity to Plug in two GPS Receiver Cards. The offered configuration shall include single GPS module with complete kit and 60m cable. The GPS card allows the SSU to generate ITU-T G.811 compliant output. The GPS Inputs shall not dilute the number of Inputs asked above. The SSU shall be offered with single GPS module having flexibility to upgrade it with second GPS inputs using plug-in module/card for future requirements.

- **Outputs:** The SSU shall be offered with minimum 04 Outputs 1:1 protected with 75 ohms (unbalanced) / 120 ohms (balanced) output interfaces connectors.

- **Tracking & Holdover**: The tracking & holdover card in 1:1 protection providing high stability Rubidium & Quartz Crystal Oscillator of better than 5x10E-11/Month (Rb) and 1x10E-10/day (OCXO) meeting ITU-T G.812 type-I, II, III, IV & V. The pair of Tracking and Holdover Cards (THC) must ensure redundancy and phase alignment between both cards, in the instance that an active THC is removed. In the event when THC are removed or in alarm condition, the SSU should go in Pass through mode. The SSU should be offered with Rubidium holdover module (main) and OCXO holdover module as redundant card.

- **Management:** The management card of SSU should have RS-232/ Ethernet 10/100 Base-T (TCP/IP) communication interface for local management of the unit. The SSU will also be equipped with Management Card, which should have key features as; gathers the status of all cards of SSU, events and alarms storage and timing, retaining every card's firmware in its memory, FTP client for firmware upgrade, remotely software upgradable etc. It shall also concentrate all shelf alarms and provides visual indicators (LEDs) for in-station monitoring. For extending alarm to SDH NMS system, it must provide required voltage free contacts.

- **Input Power Supply**: The SSU must be equipped with two DC power supply inputs. The power supply voltage range should be 40VDC to 60VDC. It is preferred that power supply fuses are located on the front panel for easy access.

- **Maintenance:** The SSU should not require any routine maintenance. The SSU should be able to detect hot module insertion or extraction, outdated firmware version and capability to firmware upgrade every single card remotely without on-site intervention. After powered-off the shelf or removed any card, each card should keeps its own configuration.

- **GPS Input Sub-System**

  The GPS Reference Source shall be based on the International Global Positioning System to provide a timing reference with a good long-term stability as per the ITU-T standard. The GPS reference Source will provide a synchronization reference to the SSU. The GPS system shall be provided with required Antenna, Cable, Lighting Protection Kit and associated fixtures and mounting assembly. The Antenna cable shall meet the latest international standard and should be of minimum 60 metres. The interconnecting cable for GPS antenna to lightning protection kit should also be provided. The vendor will supply, install and commission the GPS antenna, cable and Lightning protection kit meeting the site conditions and requirement.

3.3 **TECHNICAL SPECIFICATION FOR IP BASED EPABX SYSTEM**

IP based EPABX systems shall conform to the latest editions of standards like CCITT, CCIR, BS, IEC, IEEE, EIA, IS etc. and also shall meet the following as a minimum:

1.1 System Architecture:

1.1.1 The system shall be designed with IP at the core. The system should also support IPV6 to be future ready.

1.1.2 The Control Unit (hardware & software) of the system shall be built around Server platform with CPU controller having minimum 2 GHz multi core commercial microprocessor like Pentium / RISC or equivalent type.

1.1.3 The Control Unit/Server of the system should have physically duplicated configuration for its control processor, memory & power-supply module without any single point of failure. It should also conform to the model of complete "mirroring" of the information (both static and dynamic data.) as used in most computer systems.

1.1.4 Both of these active and standby Control Units/ Servers should not be in the same unit/cabinet sharing the same active backplane/motherboard, which will facilitate their placement at physically different locations (geo-redundant) for better survivability of the total system in the LAN/WAN network.

1.1.5 The IP based EPABX system should manage CAC (Call Admission Control) mechanisms to optimize the usage of the bandwidth in the WAN for multi-site configurations.

1.1.6 The system should support a 3rd geo-redundant server that would be able to take the entire load during failure or both active & standby server. Switchover from active & standby server to 3rd geo-redundant server should be automatic. The 3rd geo-redundant server should always be in sync (database) with the active server without any need of manual configuration & administration.

1.1.7 System should support internal and external LDAP compatible directory with web interface to directory.

1.1.8 The system shall support the access of system directory through Digital & IP phones.

1.1.9 The IP based EPABX system should be stored software / program controlled having multitasking operating system. The EPABX system software shall have required Anti-Virus software for the protection of APGDC's IT infrastructure as well as for the EPABX system itself.

1.1.10 The IP based EPABX system should boot from Flash RAM/Flash Disk/Hard disk. It should be possible to take system backups in Flash RAM / Flash Disk / Hard disks/CD/DVD. Memory storage shall be sufficient to meet the present requirement & future system upgradeability.

1.1.11 The IP based EPABX system should have non blocking architecture at all levels like System processing, Switching fabric & other resources like DTMF receivers, R2 Receivers.

1.1.12 The IP based EPABX system should support following traditional TDM or mixed IP-TDM or full 100% IP configurations on the same platform using same loaded software:

(i) IP Communication Devices e.g. IP Phones, Mobile IP Phones, multimedia PCs, SIP phones, Soft Phone or H.323 terminal devices etc.

(ii) Legacy TDM communication devices (Digital and analog 2 Wire telephone instruments with or without caller-id (Both FSK and DTMF), Fax, modems etc.). Digital Phones & Analog Phones of EPABX system shall have smooth & trouble-free operation using standard 2-wire telephone cable with minimum length of 1.5 Km and 5 Km respectively from EPABX system.

(iii) Wireless/ Mobility/ Limited mobility in local loop like VoWLAN, WiFi.

(iv) Dual mode Fixed Mobile Convenience (WiFi/ Cellular)

1.1.13 The IP based EPABX system should be based on universal port architecture and be modular in design to enable seamless growth of subscriber & trunk interfaces, by adding the desired necessary cards as and when required. System should not impose any restriction in terms of slots usage for a particular functional benefit.

1.1.14 The IP based EPABX system should support for voice encoding the following standards as a minimum:

(i) G.711, (ii) G.729A/B

1.1.15 The IP based EPABX call switching for internal calls (i.e., limited to a single location) should be based on the G.711 uncompressed PCM standard, but WAN calls outside the location may use the G.711, G.729A/B compression algorithm.

1.1.16 The IP based EPABX system must support Network Time Protocol to synchronize the system data/time of network devices.

1.1.17 The IP based EPABX system should be suitable to accommodate both Decadic Pulse (DP) and DTMF telephones. The system should support outgoing DTMF transmission even from Digital / IP phones.

1.1.18 The voice and signalling frames in the IP based EPABX system should be marked (tagged) in order to be recognized. The standards of marking supported will be: Layer 2: IEEE 802.1p/Q and Layer 3: TOS / DiffServ

1.1.19 VoIP Support:

(i) The IP based EPABX system should support VOIP solutions as an integral part of the system.

(ii) The IP based EPABX system should be fully compliant to VOIP standards like H.323, SIP (Session Initiation Protocol).

(iii) The IP based EPABX system should support the QOS features for the VOIP implementation.

(iv) The system must support Echo Cancellation mechanism in IP Telephony to improve voice quality.

(v) When a Desktop PC is connected behind an IP phone (on the same LAN switch port), the VLAN policy of VoIP interfaces should be configured by MAC address. In this way, the default VLAN (called native VLAN) of the Switch is applied to the PC. Explicit VLAN tagging from IP Phone is not necessary.

If the Switch is not able to use VLAN by MAC address, the IP phone must explicitly tag and use IEEE 802.1q (DHCP, TFTP, signaling and voice are tagged) and the default VLAN value for the frames sent by the PC is dynamically assigned by the Switch. The explicit tag is managed from the IP Phone.

1.1.20 The standby control unit/server should always be in sync (database) with the active control unit/server without any need of manual configuration & administration.

1.1.21 The IP based EPABX system should be able to work on any industry standard based IP network infrastructure.

1.1.22 The system should work in Central-Remote architecture with Control Units/Servers at a Central location and Remote Unit(s) at different/distant location(s). The Remote Unit shall meet the following as a minimum:

- The Remote Unit shall be an integral part/unit of Type-I IP based EPABX system. The integrating link between the Central & Remote units shall be an IP link (over WAN) having maximum bandwidth of 128 kbps to accommodate concurrent three Voice Trunk (of toll quality) & Signalling traffic as a minimum.
- All management functions like: System Configuration, Programming, Fault/Alarm management, System database backup, Accounting/Logging of traffic/calls etc. for the connected Remote units shall be provided remotely from the central EPABX system.
- The Remote unit shall provide all features & facilities as those of central unit of Type-I system without the mandatory provision of redundancy of its common & control unit(s).
- The Remote Unit shall function like an independent IP based EPABX system having its own exchange access code & flexible numbering scheme. It shall also provide following types of inter-office/unit both-way communications in addition to normal intra-office/unit communication:
  - Between central EPABX system and Remote unit over TDM/IP trunk
  - Inter Remote units (say between location-A & location-B) over TDM/IP trunk
  - Inter Remote units (say between location-A & location-B) via central EPABX system
  - Between Remote unit and EPABX (other than central EPABX) over TDM/IP trunk

- Remote unit shall support survival mechanisms that allow them to maintain 100% of the telephony services for their users, without any disruption & degradation in the intra & inter unit calls/traffic over available media / trunk, in case of failure in IP connectivity with central EPABX system for a minimum duration of 30 days. Once the IP connectivity between remote unit & central EPABX system is restored back, the remote unit shall work with central EPABX system.

- The Remote unit should be able to restart automatically & shall provide 100% of telephony service as mentioned above without human intervention when the input power supply to the remote unit is resumed after complete power failure, even under the failure of IP connectivity with central EPABX system.

1.2 System Survivability:

1.2.1 The IP based EPABX system should offer maximum availability along with redundancy provision for its critical common & control resource elements. A single incident of fault/failure in any of the critical resource elements of EPABX system shall not disrupt/affect all its extension & trunk services.

1.2.2 The critical common & control resource elements of IP based EPABX system shall minimum include Control Unit/Server (having Processor, Hard disks, RAM, Databases, OS etc), Call Server, IP interfaces, DSP resources, Tone generators, all the IO ports - Serial and Ethernet TCP/IP port, Power supplies, Ring generators, DTMF receivers, Tone detectors. It will be preferred that all hardware-units/modules of the system have their own separate power supplies mounted on the PCB itself, for better reliability and avoiding any dependence on a single card of the system. To achieve the required redundancy / reliability for the system, in case external LAN Switches are required, CISCO make Switches of latest model shall be provided as part of EPABX system.

1.2.3 The bidder must specify list of redundant items / modules included in the hardware & software configuration of the system to be supplied.

1.2.4 These active-standby Control Units / Servers of the IP based EPABX system should provide automatic failover of call processing of IP based EPABX system in such a manner that if one active control unit / server fails the standby control unit / server should be able to take the complete load of the calls automatically (without any manual intervention) & without dropping any active calls.

1.2.5 The Management Platform of IP based EPABX system must provide a backup mechanism for all critical system information in both a manual and an automatic/scheduled archival and a Disaster Recovery mechanism.

1.2.6 Addition / replacement of cards in IP based EPABX system shall be hot swappable (i.e. on power on condition).

1.2.7 The IP based EPABX system should be able to restart automatically & resume its normal operation without human intervention when power supply to the EPABX system is resumed after complete power failure.

1.3 Security Provisions:

1.3.1 System, while communicating with its associated components or / and IP based system over IP link (LAN/WAN), shall support the encryption of all IP packets with advanced encryption mechanism like: AES.

1.3.2 For the purpose of access over IP network, system should only allow secured access mechanism like SSH, HTTPS, SNMP.

1.3.3 Provision shall be available to bar unauthorized user to connect to the system.

1.3.4 Provision shall be available to protect the system against various network-based attacks & broadcast storms.

1.4 System Features:

1.4.1 The IP based EPABX system should function as Local as well as Transit switch capable of switching voice, data, video and images without any degradation and blocking.

1.4.2 The IP based EPABX system shall provide field programmable, flexible & user definable numbering scheme. The IP based EPABX should be suitable for up to 8 digit extension numbering scheme. This numbering scheme should be flexible. System should also allow mixed numbering scheme.

1.4.3 The IP based EPABX system should support automatic route selection to route the calls based on user definable priorities. This service will be transparent for users and irrespective of the physical carrier connection.

1.4.4 The IP based EPABX shall be equipped with integrate in-built Automatic Attendant application, which shall automate the handling of incoming calls. The system shall answer the incoming call & guide the caller through a high quality voice guidance menu of various options – to choose extension, operator, or directory service. The call shall be automatically routed to the destination. In case of non-response from the caller's end, the call will automatically flow over to the operator, after a pre-set delay.

1.4.5 Auto-attended system should be able to answer minimum 8 incoming calls simultaneously and place callers on hold, inform them of their position in the holding queue. The switchover from night message to daytime message must be automatic.

1.4.6 The IP based EPABX system shall have provision of automatic line testing. The system shall also have provision of automatically identifying and isolating the faulty trunks and the trunks connected to faulty media. For equipped E-1/ PRI trunk, the EPABX system shall also automatically detect line fault conditions like: LOS, AIS etc of connecting E-1 (G.703) link/media and accordingly, isolate the connected E-1/PRI trunk port from call routing. Once the faulty media / line problem gets resolved, isolated analog & digital trunks / junction shall automatically become operational.

1.4.7 The IP based EPABX system shall be provided with Call Billing system for complete recording of Internal, External and Network calls to generate various types of traffic reports such as STD / ISD / Local calls made from an Extension.

1.5 System Management:

1.5.1 The IP based EPABX system shall be field programmable using PC/Server based Programming & Maintenance system for setting / modifying all the system, user, trunk, operator parameters & features. The access control for system management operation shall be through password protection and must provide Role Based Account Management to define different levels of administrator access depending on specific function responsibility as mentioned below:

User : For viewing purpose only
Operator : For view and modify station/ trunk/ network features
Owner : For view and Modify all system level setting configuration

IP based EPABX shall be provided with Desktop PC of reputed make like: Dell, HP, Lenovo having latest hardware configuration & operating system for PC based Programming & Maintenance system and Call Billing operations. Both Programming & Maintenance and Call Billing operations shall be possible simultaneously from one desktop PC platform using single Ethernet interface. The Desktop PC shall meet the following as minimum:

- Intel 2nd Generation Core-i5 processor
- Licensed MS Window with Anti Virus provisioning or Linux
- 4GB DDR-3 1333 MHz SDRAM
- 500 GB hard drive
- DVD+/-RW
- 17-inch LCD monitor with a resolution of 1920X1080
- USB Mouse and keyboard
- Ethernet 10/100 adapter with RJ-45 connector

Programming & Management system console should also support programming and maintenance through following applications:

1) Windows based GUI application software over LAN/WAN/VPN.
2) Http over LAN/WAN/VPN
3) Telnet over LAN/WAN/VPN.
4) HyperTerminal over LAN/WAN/VPN & RS-232 port
5) SNMP over LAN/WAN/VPN.

1.5.2 The management platform must provide a user friendly GUI (Graphical User Interface) for the following tasks/operations:

(i) Configuration and Programming of services, users, categories and all system parameters and features. This module must provide centralized management in local or remote environments of a single system or a network. The network manager will be able to quickly and easily edit, create or delete any network object by the use of import/export functions and multiple operations.

(ii) Faults and Alarms Management: It shall have the provision for instant fault information, provision of automatically identifying and isolating faulty extensions & trunks and capability for malicious call tracing. It should also manage all the incidents and generate event/alarms reports informing date, hour & severity level with colour indication according to the severity level of the alarm. This module must be able to centralize the alarms and events of the total system (including remote units if any).

(iii) Accounting of all calls generated by the users including cost, date, hour. Must provide different options to group the monitoring of the calls (cost center, extension number, trunk, user, city/area associated to dialed numbers). EPABX system should have buffer of last 30 days call details in case of Call billing system/ management system failed.

(iv) Network Topology Layout: The management system should provide a topological view of the telecommunications system in graphical form such as central EPABX, remote unit(s) and connectivity.

1.5.3 All management traffic between the remote console/session and the control & management system/ unit must be encrypted for necessary system data security.

1.5.4 The IP based EPABX system shall have the provision of remote monitoring, programming & maintenance of EPABX system. This remote monitoring, programming & maintenance of IP based EPABX system from outside by the vendor shall be possible by accessing the system through a dial-up modem connection.

1.6 Inter-Operability with other EPABX systems:

1.6.1 The IP based EPABX system shall work seamlessly in multi vendor (Q-sig compliant) EPABX network environment with connectivity to PSTN. The Exchange shall support Q-Sig on PRI / BRI and shall be suitable of being networked with the existing ISDN EPABX systems with feature transparency.

1.7 Input Power: The Central unit IP based EPABX system shall be able to operate in the input DC voltage range from -44 to -54 VDC supply (<10 Amp @ 48 VDC) / AC voltage range from 180 to 240 VAC (50 Hz).The Remote unit of IP based EPABX system shall be able to operate in the input DC voltage range from -44 to -54 VDC supply (<5 Amp @ 48 VDC).

1.8 Interfacing Facilities: The IP based EPABX system shall be able to provide following interfacing facilities:

a. All Analog & Digital extensions operating on two wires only.

b. IP Extensions operating over standard CAT-5 cabling

c. The exchange must support following trunk interfaces/protocols:

i) Analog, DC Loop signaling, Decadic, DTMF Signaling, Analog lines in Ring down mode.

ii) ISDN-PRI, R2MFC, CEPT (programmable for either E1 or PRI) Trunk.

iii) QSIG compliant.

iv) ISDN-PRI trunks & BRI (Subscriber/Trunk)

v) All the common Signaling Standards for PSTN connections

vi) LAN/Ethernet, TCP-IP

vii) E1 (G.703, Balance)

1.9 Telephony Facilities: The IP based EPABX shall provide following telephony facilities as a minimum:

i) Operator Console connectivity

ii) Auto-attendant facility for DID through integrated auto-attended system

iii) Caller Line Identification for all Digital, Analog Subscribers & Trunks

iv) User programmable Station groups like: Call Pickup, Hunt on Rotation, Emergency etc

v) Connected Line identification.

vi) 3-Party Conference

vii) Direct inward dialing (DID) through C.O lines

viii) In-built Voice Guides/Announcement facility with good voice quality for (i) incoming trunks / PSTN calls. (ii) extension/code fault conditions, (iii) no answer conditions (iv) Feature activation/deactivation conditions.

ix) Emergency transfer to predefined extensions of C.O. lines on power failure.

x) In-built Music on Hold with melodious music having high audio quality, audio level selection, recording / changing of MOH using PC interface. Music on hold should support most popular digital audio format like *.wav, *.mp3 etc

xi) User Programmable Classes of Service for Extensions & Trunks.

xii) Area Code Restriction

xiii) Abbreviated Dialing.

xiv) Mixed Mode dialing (DTMF / Pulse interchangeability).

xv) Discriminative ringing for internal calls, junction/trunk calls, auto call back, wake up service and emergency reporting service

xvi) Call Parking.

xvii) Call waiting.

xviii) Line lockout

xix) Automatic Trunk Route selection on trunk overflow & fault

xx) Night service mode

xxi) Paging interface.

xxii) Boss-Secretary grouping

xxiii) Malicious call trace.

1.10 **<u>Extension Service Features:</u>** The IP based EPABX system should provide following Extension service features:

i) Direct Outward Dialing

ii) Extension to extension calling

iii) Auto Call Back on busy

iv) Call Forwarding (on Busy, No Answer, all with user/ system defined time)

v) Call Forwarding Cancel

vi) Call Transfer

vii) Call Pick up

viii) Group call pickup

ix) Do not Disturb

x) Pad lock facility or STD/ISD locking & shall not restrict local outgoing & intercom calls.

xi) Operator call

xii) Operator assisted calling

xiii) Add on Conference

xiv) Station camp on

xv) Trunk camp on

xvi) Executive override with tone indication

xvii) Last Caller Re-Dial (different than Last Called Number Re-Dialled)

xviii) One Number Service – Parallel ringing

1.11 **<u>Call Logging & Billing System</u>:** The IP based EPABX system shall support user friendly Call Logging & Billing system, which shall facilitate the following:

a. It shall allow dedicated billing systems for organization with different rates in line with DoT standard. System shall allow dedicated i.e. by number wise reports, department, section wise, authorization code, account code, top money utilizes, called number wise reports, date-wise reports etc. System shall allow out-dialed number privacy in call billing by suppressing partial or full digits for printing in the billing report. It shall provide graphical user interface for analysis of all such reports. Call billing software shall work in back ground mode.

b. The system shall give detailed information for outgoing calls on all CO lines, Analog and Digital trunk lines separately.

c. The billing software shall have feature, which shall help in evaluation of communication cost, ways to improve in answering and handling the incoming calls etc. Thus billing software shall be able to generate complete MIS (Management Information reports) giving information on the:

- Trend in cost of communication-usage of CO lines.
- Graphical reports for easy interpretation.

d. The Call billing software shall have the provision for adding/modifying/deleting the STD/ISD/Local codes, call tariff & call time zones at site as & when required to accommodate the changes carried out by DoT / Service provider time to time.

e. The billing software shall also preferably have traffic observation & performance observation features.

1.12 For each site/location, the bidder shall supply (i) the same model of rack/sub-rack for any given type of operation and (ii) the same model of cards for any given type of extension/trunk interface such as Analog line, Digital extension line, BRI, PRI etc. Multiple models of rack/sub-rack for same requirement or multiple models of cards for same type of interface at a single site/location are not acceptable.

The extension (Analog, Digital & IP) & trunk interface (E-1/PRI) modules/cards should be of same model in Central location of [i.e. APGDC pipelines] of IP based EPABX system, so that they can be interchangeable without any degradation in performance/operation.

1.13 **<u>Technical Specifications of Desktop Operator Console (OPCON):</u>**

The IP based EPABX system should support desktop Operator Console, which shall have connectivity with EPABX system using one pair of telephone cable and it shall provide the following minimum facilities:

i) Operator Extension should be configurable for Working Hours and Non-working Hours

ii) Minimum 29 functional and programmable keys

iii) Control access to specified trunks

iv) Minimum 40 character alphanumeric display

v) DTMF Dial Pad with call processing buttons.

vi) Lamp indications for console status and system alarms.

vii) Multiple tenant groups with designated group queue and night service extensions.

viii) Trunk verification

ix) Name dialing

x) Status indication of Station.

xi) Serial Calling.

xii) Priority Queuing

xiii) Force trunk release.

xiv) Override/Barge- in

xv) Monitoring of ongoing conversation: Programmable enable and disable.

xvi) Trunk group status

xvii) Visual indication for major, minor and warning alarms.

xviii) Last Number redial

xix) Hands free dialing

xx) Date and Time Display

1.14 TECHNICAL SPECIFICATION FOR DIGITAL PHONE:

i) Should work using one pair of standard telephone cable extended from the EPABX.

ii) Tilt-able Graphical Display of high resolution, minimum 4-line text message on screen

iii) Messages wait Indicator.

iv) Incoming call indication (thru display) while one line is in use.

v) Minimum 10 programmable keys & provision for additional soft-keys

vi) 4 way keys for menu navigation.

vii) Incoming Speech Gain Control.

viii) Ringer Volume Control.

ix) Full Speakerphone with high audio quality in Hands-free operation (full Duplex) & Mute facility.

x) Hot dialing from key pad for call transfer, conference (while a conversation is already in progress).

xi) Adjustable Handset and Monitor speaker volume.

xii) On-Hook dialing

xiii) Optical call alert (LED/LCD) for incoming call

xiv) Echo cancelling for local echo (AEC full duplex)

xv) Alphabetic keyboard for dial-by-name

xvi) Make: OEM of IP EPABX system

1.15 TECHNICAL SPECIFICATION FOR DESKTOP IP PHONE (with / without monitor)

The connection for IP phone will be provided by existing CAT-5 cable that is being used for data access. The IP hard phone should have inbuilt dual ports Ethernet Switch of 10/100/1000 Mbps to connect desktop PC through RJ-45. Other features should be as follow.

i) 10/100/1000BT connection: half/full duplex with auto negotiation and configuration. The maximum cable length is up to 100m (330ft) for 100BT (for cable of category 5).
ii) IP phone should have inbuilt / integrated Ethernet switch with QoS support with the facilities for TOS diffserv & 802.1p/q.
iii) Ethernet (10/100/1000 Mbps) line interface with secondary (10/100/1000 Mbps) port for collocated PC or Laptop with IEEE 802.3af power over Ethernet compliant ports.
iv) IP hard phone should support protocol H.323/SIP.
v) Protocol support for voice quality G.711, G.723.1, G.729a/b and for echo cancellation.
vi) IP addressing Static or dynamic IP parameter configuration. A DHCP client should be integrated in the set
vii) IP Configuration through an internal man machine interface during its activation allowing configuration of the main IP parameters such as:- MAC address access, Program a static IP address (if no DHCP server) and IP Subnet mask, Router IP address, Frame tagging activation/deactivation & default VLAN 802.1pq etc.
viii) Tilt-able Graphical Display of high resolution, minimum 4-line text message on screen.
ix) Messages wait Indicator.
x) Incoming call indication (display) while one line is in use.
xi) Minimum 10 programmable keys
xii) 4 way keys for menu navigation.
xiii) Incoming Speech Gain Control.
xiv) Ringer Volume Control.
xv) Full Speakerphone with high audio quality in Hands-free operation (full Duplex) & Mute facility.
xvi) Hot dialling from key pad for call transfer, conference (while a conversation is already in progress).
xvii) Adjustable Handset and Monitor speaker volume.
xviii) On-Hook dialling
xix) Optical call alert (LED/LCD) for incoming call

xx) Echo cancelling for local echo (AEC full duplex)
xxi) Alphabetic keyboard for dial-by-name
xxii) Make: OEM of IP EPABX system / For SIP Phone: Cisco or Polycom

1.16 TECHNICAL SPECIFICATION FOR ANALOG PHONE

i) Caller Line Identification (CLI) [supporting both FSK and DTMF]
ii) Pulse/Tone switch-able.
iii) Modular connection plugs for line and handsets.
iv) Electronic ringer with adjustable volume
v) Flash, pause, redial, mute functions
vi) Desktop model
vii) Line Cord –detachable - 2 Meter long.
viii) Hand set cord –detachable.
ix) Termination Box - To be provided.
x) Hook Switch endurance - 1 Million Operation
xi) No additional power requirement using Battery cell or AC adaptor
xii) Available colours - To be specified
xiii) Make/Model: Beetel P66 or equivalent

1.17 Main Distribution Frame (MDF) for exchange side of supplied EPABX system shall meet the following as minimum :

i) Connectors : Krone LSA module
ii) Capacity : As per EPABX configuration.
iii) Type of enclosure : Metallic Fully covered
Floor Mounted (Rack) Or Wall mounted (DB)
iv) Cable insertion & extraction tools : Two nos
v) To be equipped with line protection units (IPM) fuse for all Trunk & CO lines.
vi) Five numbers of Jack for line isolation and monitoring per site

1.18 REQUIRED EPABX CONFIGURATION:

New IP based EPABX system at ÀPGDC shall have configuration & setup envisaged as under, wherein the Equipped & Additional Wired capacities of various interfaces are indicated. Accordingly:

- For Equipped Capacity: The vendor shall supply, configure / provision & commission the complete facilities including the required hardware, software, firmware, cabling, and terminations in the supplied system.

- For Additional Wired Capacity: The vendor shall keep the system ready with all cabling terminated at both equipment (for vacant / free slot) & MDF ends excepting the provision of hardware module in the supplied system. With the installation of interface module in the wired slot, the facility will be available at MDF.

In addition to the above mentioned Equipped & additional Wired capacity, the IP based EPABX system should also be expandable up to certain defined capacity, as mentioned below. This expansion should be in building block architecture by adding on additional cards / stacks / cabinets at central EPABX system. However, such expansion up to the defined Expandable Capacity should not involve any addition / upgradation of Processor, Software .

For each of the sites, licenses has to be supplied for all hardware module / software / firmware of the IP based EPABX systems up to the aggregated capacity of their individual 'Equipped Capacity' & 'Additional Wired Capacity', as mentioned below.

This IP based EPABX system of Pipeline locations shall have following configuration/setup with Expandable Capacity up to 200 lines (inclusive of all types of Subscriber & Trunk Lines):

(a) Central EPABX system at CB region

This system at APGDC pipelines shall be equipped with minimum following, meeting the tender requirement:

S. No	Description of Items (inclusive of Hardware, Software & Firmware)	Equipped Capacity with license	Additional Wired Capacity with license
1	**Common & Critical Control unit**	**Duplicated in Hot Stand-by configuration**	
2	**Analog Subscriber / Extension port (nos.)**	100	50
3	**CO line (for PSTN connection) port (nos.)**	10	05
4	**Digital Subscriber / Extension port (nos.)**	10	10
5	**IP Phone Subscriber provision (nos.)**	50	
6	**PRI (2 Mbps) [G.703, 120 ohms balanced] Trunk port (nos.) (Maximum two ports on each PRI module)**	02	02
7	**IP Trunk provision (nos.)**	10	10
8	**Desktop Operator Console & associated items**	Two sets	
9	**PC Based Programming & Maintenance, Billing and Accounting Facilities inclusive of Hardware, Software and associated items.**	One Set	
10	**Exchange MDF to cater all equipped Subscriber lines, Trunks lines & CO lines.**	1 set equipped for 300 Terminations (minimum)	
11	**IP Telephone Set (nos.)**	As per MR	
12	**Digital telephone Set (nos.)**	00	
13	**Analog Telephone Set (nos.)**	As per MR	
14	**Voice Mail**	No	

TEC COMPLIANCE:

The offered model of IP based EPABX system should have approval from TEC for interfacing with PSTN. In this regard, duly notarized copy of TEC certificate is required be submitted with the un-priced bid document. This TEC certificate should be valid for minimum period of six months from bid due date.

1.19 FXO-FXS VOICE GATEWAY SETUP FOR PIPELINE VOICE COMMUNICATION:

For extension of analog telephones to the remote locations via Ethernet / IP network, FXO type VoIP gateways shall be provided at EPABX side and FXS type VoIP gateway shall be provided at remote location to which analog phone shall be connected.

FXO VoIP gateway shall be provided at EPABX location with no. of ports suitable for as per the requirement while 4 Port FXS VoIP and four additional ports gateways shall be provided at remote location.

The FXO and FXS VoIP gateways shall be compact in design with different port options and shall support transparent voice calls on all ports using a standard analog telephone.

VoIP gateways shall support industry standard SIP, H.323 and G.729, G.723 codes.

Inter-station voice communication facilities of toll quality shall be provided for Watchman/Security personnel and for Pipeline Maintenance purpose at all unmanned RR Stations utilizing the FXO-FXS setup meeting the technical specifications mentioned below, using total dedicated IP/TDM bandwidth of 2 Mbps over new SDH network along the pipeline.

1 GENERAL

Input Power Supply : -44 to -54 VDC
Equipped Capacity : Minimum 4 nos. of FXS ports per site
Minimum 24 nos. of FXO ports per site
WAN Interface: 1 x 10/100 Base-T (RJ-45 Port)
FXO Connectivity: 2-wire Loop start on RJ-11/12, Ring detection, tone detection, disconnect supervision Caller ID detection
FXS Connectivity: 2-wire Loop start on RJ-11/12, Ring and On-Hook Voltage, Caller ID
Voice Signaling: H.323, SIP, DTMF, All tones programmable (dial, ringing, busy)
Management: Web/HTTP, CLI with local console and remote Telnet access

2 FXS CONNECTIVITY

- Trouble-free operation over 2-wire standard telephone cable of minimum 1 Km length
- Supporting DTMF dialing
- Caller-ID provision
- Trouble-free operation with standard Analog DTMF Phone & Weather-proof Telephone
- In-built Ringer for feeding ring signal to Telephone set

3 FXO CONNECTIVITY

- Trouble-free operation over 2-wire standard telephone cable of minimum 1 Km length
- Trouble-free operation with Analog Extension of EPABX system
- Programmable ring detection, tone detection, disconnect supervision.
- Caller ID provision

1.20 WEATHER-PROOF PHONE

S. N.	Parameter	Technical Specification
	Description	Weather-proof analogue phone with all accessories i.e., Handsets, Cords, Glands, Inbuilt ringer etc. (entire filling must be in a single enclosure)
1	Housing material	Glass-fibre-reinforced polyester/Aluminium (LM6) alloy.
3	Hardware	External: Stainless Steel; Internal: Brass-Nickel plated
4	Finish	Anti-corosive Epoxy Power
5	Display	2-line alphanumeric display
6	Keypad	Minimum No. of keys: 0 to 9, * , #, Flash, Redial
7	Dialling	DTMF and Pulse Mode switchable
8	Degree of protection	IP66
9	Impact Protection	IK09
10	Operating Temperature	0°C to +60°C
11	Ringing Sound Pressure Level	app 90 db(A) at 1 m distance
12	Line Voltage	~48VDC (EPABX line)

13	Mounting	Wall / column / structural
14	Handset cord	Stainless Steel spiral cord
15	Compatibility	Fully compatible with all EPABXs'Analog Telephone line
16	Cabling	Single pair Telephone Cable

1.21 EXPLOSION-PROOF PHONE

S. N.	Parameter	Technical Specification
1	Description	Intrinsically safe Explosion-proof analogue phone with all accessories i.e., Handsets, Cords, Glands, Inbuilt ringer etc. (entire filling must be in a single enclosure)
2	Housing material	Glass-fibre-reinforced polyester/Aluminium (LM6) alloy
3	Hardware	External: Stainless Steel; Internal: Brass-Nickel plated
4	Finish	Anti-corrosive Epoxy Power
5	Approval	ATEX/CCOE/CMRI
6	Display	2-line alphanumeric display
7	Keypad	Minimum No. of keys: 0 to 9, * , #, Flash, Redial
8	Dialling	DTMF and Pulse Mode switchable
9	Degree of protection	IP66
10	Impact Protection	IK09
11	Operating Temperature	0°C to +60°C
12	Ringing Sound Pressure Level	app 90 db(A) at 1 m distance
13	Line Voltage	~48VDC (EPABX line)
14	Temperature Classification	T6
15	Certified for use in Gas	I and IIA and IIB
16	Zone Classification	Zone-1 and Zone-2
17	Intrinsically safe	Ex "ib" /IIC /II 2 D protected
18	Mounting	Wall / column / structural
19	Handset cord	Stainless Steel spiral cord
20	Compatibility	Fully compatible with all EPABXs'Analog Telephone line
21	Cabling	Single pair Telephone Cable

1.22 EXPLOSION PROOF TELEPHONES ACOUSTIC BOOTHS

General

The explosion proof telephones shall be housed in a full enclosure with Howler & flashing beacon acoustic booth installed outside the acoustic booth. The acoustic booth shall be full enclosure with Howler & flashing beacon type with doors. The acoustic booth shall house the explosion proof telephone set, including all accessories for fixing to the telephones set. These telephones shall be connected through EPABX at manned stations.

The acoustic booth will reduce noise level (≥ 15 dB) and protect the telephone. Location of these telephones shall be finalized during detailed engineering. Vendor's scope include supply of all materials, interface, cabling, power supply, trenching, back filling etc., all complete.

One galvanized cable tray shall be fixed on the steel pole to guide and protect cables. One hole shall be provided in the floor-mounted plate to facilitate entry of cables.

Specification:

Wiring, Cable glands, shall be included with the equipment. All cables outside the building shall be armoured type. All hardware such as nuts, bolts, washers etc. shall be cadmium plated or zinc passivated. All equipment shall be coated to ensure proper corrosion protection.

Acoustic booths shall have polyester powder coating of 60 um minimum in case of metal or should be made of FRP. Galvanization thickness for steel pillar and flash support shall be 80 um minimum. All metallic parts which are not permanently protected against corrosion shall be protected with anti-corrosion painting. Vendor shall indicated the extent of noise reduction for the offered acoustic booths.

3.4 OPTICAL FIBER PIGTAIL, CONNECTORS & OPTICAL PATCH CORDS TO BE USED IN THE FTC

The single mode fiber pigtails and connectors should meet the ITU-T recommendations G-652 D & G- 655 as required.

Both connectors and cable should be robust and should withstand wear and tear due to frequent use, Connection and disconnection. Normal expected life should be 15 year or more. The patch cords provided shall be 20 mtr in length.

Optical Fiber Cable, Patch Cord connections & pigtails shall be fully compatible and matching to each other.

PARAMETERS OF CONNECTORS WITH PIGTAILS

Insertion Loss	:	Maximum 0.3db per connector plus fibre loss
Return Loss	:	Better than 40db
Temperature Dependency	:	< 0.3 db from -20 to +60
Change in connection Loss with passage of time at 60 ^{o}C for 100hrs	:	It should be < 0.3db
Change in connection loss due to vibration	:	< 0.05 db
Reproducibility of connection loss by repeated connection and disconnection for 500 times.	:	< 0.05 db
Change in connection loss in relation to tensile Strength	:	Loaded : -50db, Unloaded : -30db

The specification of Jointing Closure, Jointing Pit, Marker, and make of electronic marker shall be provided to Vendor for rectification / restoration of damaged OFC if required.

3.5 LAN Switch

a)	Number of ports	Minimum 24
b)	Data rates	10/100/1000 Mbps
c)	Connectors	RJ45
d)	Standard supported	IEEE 802.1d, 802.1p, 802.1q, 802.1w, 802.1x, 802.3ad, 802.3af, IEEE 802.1s

3.6 TECHNICAL SPECIFICATION OF CLOSED CIRCUIT TELEVISION (CCTV) SYSTEM

3.6.1 GENERAL;

An IP based CCTV system is envisaged for this project. Closed circuit televisions cameras, cables, power supply converters, switches, etc as required shall be provided.

Fixed type and PTZ cameras along with IR illuminators ONE each shall be provided at all Terminals. These cameras shall be integrated with new NVR system.

For pipeline client work stations to be provided at locations specified in MR. The system shall provide User activity log (audit trail) with user id, time stamp, and action performed, etc.

NVR (Camera Server) with open architecture shall be provided as per specifications. OEM of Cameras, Encoders, Decoders, NVR, Servers, NAS box /Raid backup device, Workstations, Monitors, and Switches shall be IS0 firms & the offered products must be CE certified.

Server software shall operate on open architecture (complying to ONVIF standard /specifications) and should not have any restriction / limitation in the form of license for future integration with perimeter safety, access control PA and fire / safety system / other CCTV systems or increase (of camera quantity upto 25 % of total present quantities & mandatory spares) / or decrease in any hardware / software and shall be based on open standards and open / free license.

Camera Licence and storage shall be calculated as quantity as per MR plus Mandatory spares plus 25 % cameras for future.

3.6.2 ENVIRONMENTAL CONDITIONS:

The CCTV System offered shall be capable of maintaining its guaranteed performance when operating continuously round-the-clock under the following environmental conditions.

a)	Operational Temperature	0.0 C to +35.0 C [For NVR/CAMERA SERVER & NAS backup device/Storage]
		0.0C to +35 0 C [For all other supplied items, that are to be installed indoor, if not mentioned otherwise specifically under specification]
		0.0 C to (+) 50.0 C [For all other supplied items, that are to be installed outdoor, if not mentioned otherwise specifically under specification]
b)	Storage	0.0 C to +70.0 C
c)	Shock and vibration	The equipment shall withstand transportation & handling by air sea & road under packed conditions
d)	Electro Magnetic	As required for electronic equipment working in vicinity of compatibility HF/VHF/UHF systems

3.6.3 Applicable Codes, Standards, Abbreviations & Definitions

3.6.3.1 International Codes and Standards

The CCTV Surveillance System (CCTV)) shall be designed, manufactured, assembled and tested in accordance with the latest codes standards of the Standards Institution, Institute of Electrical Engineers and Manufacturer's association of the country where they are manufactured / country of principals. They shall also conform to the relevant standards of the Bureau of Indian Standards (BIS) wherever applicable, so that specific aspects under Indian conditions are taken care.

3.6.3.2 The CCTV Surveillance System (CCTV) shall also conform to the latest Indian Electricity Rules as regards safety, earthing, Ethernet surge & lighting protection and other essential provisions specified there in for the installation and operation of electrical equipments.

3.6.3.3 Entire CCTV Surveillance System (CCTV) & all equipment shall comply with the statutory requirements of the Government of India and the State Government.

3.6.3.4 The equipment specified is to be designed in accordance with the applicable standards listed below.

a. Bureau of Indian Standards (BIS)
b. International Electro-technical Commission (IEC)
c. Institute of Electrical electronic Engineers (IEEE)
d. Instrumentation Society of America (ISA)
e. National Fire Protection Agency (NFPA)
f. Open Software Foundation (OSF)

3.6.3.5 Conflicting Requirements

In the event of any conflict between the tender documents and related standards and codes or any other attachment to this tender, the Bidder shall follow the following documents in the order of their priority:

a. Statutory requirements.
b. Tender documents.
c. Codes and standards.

In case of contradiction between any specification, Bidder shall refer the matter to CLIENT/MECON for clarification. CLIENT's decision in this regard shall be final and binding.

3.6.4 CCTV system guidelines

3. The complete CCTV system with all required accessories, video connectors, patch connectors, patch leads, mounting and fitting hardware, plugs, sockets, and any hardware/software, supply of cables, network components, etc. as required for complete installation of the System under this contract.

4. The CCTV System shall be based on a digital network solution that enables video, data and/or audio streaming over an IP network.

   The system shall comprise of digital IP cameras (in case analogue explosion proof cameras are offered, they shall be connected to the network using video servers/ encoders) , network video recording system, digital and/or analogue monitors, external array of hard disks, tape drive with backup tapes, control keyboard, servers, workstations and all necessary equipment for the required applications. The System should have ONVIF (*Open Network Video Interface Forum)* standard/specification compliant CCTV Cameras& Software (Video Management, Video Motion Detection, Analytic Software etc.). The system shall be of open architecture and shall be able to add support for any new video source quickly.

5. The entry and exit points covering security gates areas shall be constantly monitored through High sensitive CCD cameras using fixed focal length/ zoom lens (as required) and motion detection software. The suggestive locations and the quantity indicated in MR.

6. All cameras shall be linked to the unit or local security control room through Virtual Matrix which shall enable the operator to switch on any camera on any monitor by a simple drag and drop action on his workstation.

7. Pictures from various cameras locations shall be displayed on Video monitors on a programmed sequence and in short selectable time intervals with facility of automatic switch over to the area of intrusion or threat on receipt of alarm signal from the effected sensor(s) as applicable.

8. Facility shall be provided for multi-view display on Video monitor. It is also possible to have free enlarged view and freezing of picture on video monitor from any camera and also its video recording if required.

9. The system shall be scalable to accommodate future addition of Cameras.

10. The cameras shall be mounted suitably on MS poles or on building top or top of guard room as per site condition to cover entire area and process area. Inside the building, cameras may be installed at suggestive locations Self supported brackets as required.

11. All accessories and fitting hardware such as brackets / poles together with associated masonry work are included in the scope of work. No separate payment would be made under this head.

12. The cameras shall be provided with ID date/time stamp generators & create tamperproof records for post event analysis.. The cameras shall be designed to withstand all weather conditions, including storm. The IP rating and mounting details shall therefore take this into consideration.

13. For all above Security Surveillance cameras & operational area cameras shall be connected with CCTV system on SDH OFC cable networks on ring topologies. The suggestive locations and the quantity indicated in MR. Based on the bandwidth requirement per camera, the No. of cameras per loop shall be finalised including consideration of 25% bandwidth for future.

14. The overall Video system shall be connected via a dedicated and secured LAN network with the fibre optic/CAT6 communication system on SDH network topology. Based on bandwidth requirements, number of loops need to be formed. The entire CCTV system shall be connected through suitable Ethernet cables. The required LAN & network ports shall be provided by bidder as nearer as possible to the camera locations. However any minimum cables/connectivity required during execution shall be performed by bidder.

15. The CCTV system should permit a minimum recording of 30 days of each camera. As a default, the video signal recording shall be configured based on the change of movement only to minimise the memory usage & traffic loading on the fibre optic network, however based on operational needs & during system setup it shall be configured for continuous recording for selected cameras.

16. The network video recorder shall be installed that shall allow the storage of time-lapse and time stamped digital video images from all cameras. Video images shall be stored on a RAID hard-drive unit with full watermarking and guarantees against tampered images.

17. A further RAID hard-drive, a tape drive and DVD burner unit shall be installed on the CCTV LAN network at CR so that a regular backup can be accomplished at pre-determined times. Video recording shall be carried out based on specific schedules. Space requirement for accommodation of all the Memory Equipments shall be considered during the design of the Control Room Layout.

18. System should provide inter-operability of hardware, OS, software, networking, printing, database connectivity, reporting, and communication protocols. System expansion should be possible through off-the shelf available hardware. The system shall include a scalable architecture with hardware expansion capability to support the selection, monitoring and control of system devices possibly using simple user friendly GUI based maps, menus and left/right mouse click commands.

19. System should facilitate viewing of live and recorded images and controlling of all cameras by the authorized users. The Authorization shall be using a Pass Word.

20. The entire CCTV system shall provide network interfacing with local and remote PC workstation and keyboard for 24 hours a day and 7 days per week local and/or remote monitoring.

21. The system shall be able to select any cameras to any monitors. However, the system administrator shall be able to control the viewing rights of individual users.

22. The CCTV Cameras must be FCC or CE and UL Certified. The System shall use a combination of IP Fixed cameras (Dome-type / Box-type cameras/ IR Bullet Camera) & IP PTZ Cameras. The video shall be compressed using H.264 or better standard and streamed over the IP network.

23. The CCTV system shall be designed such that any failure in this system shall not affect the normal operation of the entire integrated system, the remaining system components shall continue to operate with full functionality, that is, no single-point-of-failure (SPOF).

24. All interfaces within the CCTV shall be based on TCP/IP network protocol connectivity over the intranet/ LAN.

25. The CCTV system shall be integrated via the fibre-optics cabling Ethernet LAN backbone network.

26. System redundancy shall be implemented and installed for main servers.

27. MS poles would be used for heights upto 3 -5 meter or roof top with small pole may be used.

28. All necessary cables including Power, networking and video / communication cables shall be considered which shall be laid in HDPE Conduits & Mounting structures and accessories shall be provided by the Contractor as per requirement.

3.6.5 CCTV system selection criteria:

1.1 The System shall be mainly comprising of the below-mentioned items:

a) ***True IP* CCD/CMOS Colour Video CCTV Cameras for image & video capturing, having Fixed or P/T/Z Lens with individual IP addresses;**
b) Network Video Recorder (NVR) Server(s) / Camera Servers running Video Recording Software, Video Management Software, Video Motion Detection Software / Video Analytic Software etc;
c) Network Attached Storage (NAS) for archiving/storage of the recordings;
d) Application software (Video Recording Software, Video Management Software, Video Analytic Software and other required software);
e) Client Workstation for System Administration / Management / Maintenance / Video Analytics etc along-with LED Monitors, Keyboards, Mouse, Joystick controllers / Mouse-Keyboard for PTZ Cameras;
f) Network Ethernet Switches for switching and routing various data etc.

1.2 All the control equipments e.g. NVR/CAMERA SERVER, SAN/NAS/RAID backup device, decoders etc. shall be provided in standard Racks.

1.3 The System shall be an open standard based integrated system with IP network centric functional and management architecture aimed at providing high-speed manual/automatic operation for best performance. The System should have ONVIF (*Open Network Video Interface Forum)* standard/specification compliant CCTV Cameras & Software (Video Management, Video Motion Detection, Analytic Software etc.). The system shall be of open architecture and shall be able to add support for any new video source quickly.

1.4 **The CCTV Cameras must be FCC or CE and UL Certified.** The System shall use a combination of IP Fixed cameras (Dome-type / Box-type cameras/ IR Bullet Camera) & IP PTZ Cameras. The video shall be compressed using H.264 or better standard and streamed over the IP network.

1.5 Inbuilt encoders inside the cameras shall digitize analog video, compress the digital video using various compression algorithms (H.264 or better standard), and transmit the compressed digital video over packet-based IP network. Inbuilt encoders shall have less than 150 ms of latency and shall support dual stream of H.264.

1.6 The System shall use video signals from various types of indoor/outdoor *True IP* colour CCTV cameras installed at different locations, process them for viewing on workstations/monitors at 'Designated Locations' for CCTV monitoring and simultaneously record all the cameras as per requirement after compression using H.264 or better standard. Joystick or Mouse-Keyboard controllers shall be used for Pan, Tilt, Zoom, and other functions of desired cameras.

1.7 PTZ Cameras shall have 64 or more pre-defined positions, to be selected through suitable input command.

1.8 The Area under surveillance shall be monitored and controlled from 'Designated Locations' for CCTV monitoring through workstations and Joystick controllers / Mouse Control. The System should facilitate viewing of live and recorded images and controlling of all cameras by the authorized users present in the Network.

1.9 Designated Locations for CCTV monitoring will have workstations along with controllers for Camera operation. For monitoring purposes, required quantity of minimum 60 inch LED Video monitors shall be setup along-with one client work-stations (client workstation shall support dual monitors for expanded/independent view) with suitable mounting arrangements, as per APGDC's requirements.

1.10 All Cameras shall be Day/Night cameras. Cameras should have in-built IR illuminator or Industry standard External IR illuminators shall be used along-with cameras.

1.11 **Housing of cameras** meant for indoor use shall be vandal-resistant whereas outdoor camera housing shall be of IP 66 or better rating.

1.12 Network Video Recorder (NVR) Server(s) / Camera Servers shall be standard HP/IBM/DELL/ORACLE servers available off-the-shelf, on which all 64-bit software like Application software, Video Management software, Video Recording Software, Video Motion Detection / Video Analytics Software shall be installed & operate.

1.13 The NVR shall offer both video stream management and video stream storage management. The recording resolution and frame rate for each camera shall be user programmable.

1.14 All camera recordings shall have Camera ID & location/area of recording as well as date/time stamp. Camera ID, Location/Area of recording & date/time shall be programmable by the system administrator with User ID & Password.

1.15 Video stream from individual cameras shall be recorded on respective NVR/Camera Server &, subsequently, archived to NAS storage device. System shall have provision to automatically over-write the new information after the period of 30/31 days in FIFO manner & necessary script/algorithm must be available in the application.

1.16 In order to optimize the memory, while recording, video shall be compressed using H.264 or better standard and streamed over the IP network.

1.17 The Client Workstations shall be able to directly access videos stored in NAS backup devices for playback.

1.18 Redundancy/Fail-over feature is required (in N+1 configuration) i.e. in case of failure of an NVR/CAMERA SERVER the relevant cameras under its control / management shall automatically switch over to the redundant NVR/CAMERA SERVER.

1.19 Synchronized Failover feature should be provided with the System to avoid any single point of failure and the System should sustain all its current operations i.e. Recording, playback and live video even in the event of primary / failover server failure.

1.20 All the Client Workstations in the System should be provided with software along-with its license, to view and control the cameras and retrieve the recorded video images from the NVR/CAMERA SERVER/NAS storage device seamlessly. Web view of cameras shall also be supported by the system.

1.21 The Video Recording & Management Software of the CCTV Surveillance System shall support the following:

- The software shall operate on open architecture (complying to ONVIF standards/specifications) and should not have any restriction/limitation in the form of license for future integration with perimeter

safety, access control, PA and fire / safety systems/other CCTV systems or increase (maximum increase upto 25% of current requirement) /decrease in any hardware/software and shall be based on open standards and open/free license.

- The software should have inbuilt facility to store configuration of cameras.
- The software should be able to control all cameras i.e. PTZ control, Iris control, auto/manual focus, and colour balance of camera, Selection of presets, Video tour selection etc.
- The software shall be able to generate reports of stored device configuration and shall be able to provide alarm and alarm log.
- The software should have user access authority configurable on per device or per device group basis.
- The administrator should be able to add, edit & delete users with rights. It shall be possible to view ability / rights of each user or the cameras which can be viewed & controlled as per the permission assigned by the administrator. The users should be on a hierarchical basis as assigned by the administrator. The higher priority person can take control of cameras, which are already being controlled by a lower priority user. There should be minimum 3 hierarchical levels of security for providing user level log in.
- It should have recording modes viz. continuous, manual, or programmed modes on date, time and camera-wise. All modes should be disabled and enabled using scheduled configuration. It should also be possible to search and replay the recorded images on date, time and camera-wise. It should provide onscreen controls for remote operation of PTZ cameras. It should have the facility for scheduled recording. Different recording speeds (fps) and resolution for each recording mode for each camera should be possible.
- The settings shall be individually configurable for each alarm and each camera pre-record duration. This shall allow the Camera Server to capture video prior to the alarm/event, as well as after the alarm/event. It shall be selectable from a list of values ranging between 0 seconds and 2 minutes or more.
- The software for clients should be working on a browser based or client based system (All required licences for the client software shall have to be provided to APGDC free of cost) for remote users.

1.22 The system must support video motion detection algorithms (residing either in CCTV Cameras or Video Management Server end). The enabling of Video Motion Detection shall be user-configurable: either in a continuous basis or in scheduled manner for particular times, dates, days, months etc.
The algorithm must be able to provide the minimum functionalities of detect and track objects, learn the scene, adapt to a changing outdoor environment, ignore environmental changes including rain, hail, wind, swaying trees and gradual light changes.
The user shall be able to configure the parameters for each camera:

- Detection Type: Continuous or scheduled
- Actions to Perform When Motion is detected: Generate an alarm in the Security System & Start a recording.

1.23 The system shall support video analytic software for real-time processing of live video streams and take consequent actions based on the rules set in the system. As the Video Analytic Software is resource hungry, selection of CCTV Cameras for which Video Analytic Software is required to be implemented, shall be planned before designing the system hardware. The system shall support activation of the video analytic software for any or all installed CCTV Cameras. The system must have the minimum features for:

- **Intrusion detection**
- **Wrong direction movement detection**
- **Trip-wire**
- **Crowd detection**
- **People & Object Counting**
- **Camera Tampering**
- **Loitering**
- **Unattended Object detection**
- **Object Removal detection**

The Software shall support seamless integration with all other software of the system. The software should be ONVIF compliant and the API for integration with 3rd party video management systems shall also be available.

Number of Server machine and its capacity shall be suitable for video management systems & Video Analytic software to run all the cameras including spares as define. Bidder shall furnish their consideration and supply additional machine as required.

The system shall be flexible and of open architecture so that it should be possible to implement any custom video analytics feature as per requirement during implementation of the system.

1.24 System shall be triplex i.e. it should provide facility of Viewing, Recording & Replay simultaneously.

1.25 The System should ensure that once recorded, the video cannot be altered; ensuring the audit trail is intact for evidential purposes.

1.26 System must provide built-in facility of watermarking or Digital certificate to ensure tamperproof recording so that these can be used as evidence at a later date, if so desired. The recording shall support audit trail feature.

1.27 The offered system shall have facility to export the desired portion of clipping (for a duration: from a desired date/time to another desired date/time) on CD or DVD. Viewing of this recording shall be possible on standard PC using standard software like windows media player / supporting format etc.

1.28 System should have feature to generate alert in case of any tampering with the CCTV cameras.

1.29 System should have feature to generate alerts when the data utilization in storage system gets near to its full capacity.

1.30 The System should provide inter-operability of hardware, OS, software, networking, printing, database connectivity, reporting, and communication protocols. System expansion should be possible through off-the-shelf available hardware like servers and PC/Workstations.

1.31 The System must support integration with Access Control System, Fire-Alarm Systems and open protocol like MODBUS, MODBUS TCP/IP.

1.32 The System should not require any renewal / upgradation of any license (for Hardware / Software) without any system upgradation after successful commissioning of the system at site.

1.33 System must have facility of additional camera installation with all existing functionalities and features beyond the required total number of cameras without any requirement of additional license (the maximum additional camera requirement can go up to 25% of the required total number of cameras).

1.34 System shall have provision of integration with APGDC's Telecom / IT infrastructure for extending the accessibility / monitoring of CCTV cameras to/from other APGDC locations. The System must have the capability to integrate with other IP network for remote operation / monitoring of the system. The system shall support Remote Clients with following minimum functionalities:

- Login from client software
- Remote view and search
- Remote configuration

1.35 The system shall support web based clients connecting to it via the Internet.

1.36 The System shall keep track of all configurations & events in the form of log. This will help in proper System administration & management of redundancies etc.

1.37 The System shall support the following provisions for system integration & customization:

- Simple API for integration with 3rd party Video Management Systems
- Advanced meta data streaming API
- Seamless connection with Video Analytics Enterprise server used for managing individual Video Analytics Software instances and generating combined reports.

1.38 The System should support automatic full system restore after unexpected events like complete power loss.

1.39 All the major components of the CCTV systems shall be latest but field-proven and shall not be End-of-Life / Outdated; the same shall have to be supported by concerned OEM for at-least 5 years period from the date of supply. Certificate in this context from concerned OEM may be asked for during procurement / ordering.

1.40 The CCTV System network to be implemented along pipeline (including its associated SV/IP/Terminals) shall have CCTV Cameras along-with its associated items installed in pipeline stations and its NVR, Storages shall be installed in distributed fashion at dedicated control room in redundant configuration.

3.6.6 CCTV System & Equipment Description

1. The CCTV central control equipment and video LAN server shall be installed in a standard cabinet located in the Equipment Room. This cabinet shall also house all the termination equipment required for the CCTV monitor and the interface equipment.

2. At each location, video signals and camera control signals from each camera shall be routed directly on a local Ethernet to a video unit using fibre optic cable or PoE switch. The armoured fibre optic single mode cable shall be used for the video & data signal transmission & when distance is more for the use of **CAT6 armoured cable.** All cameras on each location shall either utilise PoE local Ethernet switch or separate power through power cable. The video unit shall also control the zoom, and alarm functions for each local camera. It shall also control the video compression rates for recording and for transmission of the video data onto the LAN network back to the central server at the Equipment Room.

3. When cameras are not with PoE feature, the Power cable shall be separate from the video and data cable and shall be installed directly from the CCTV rack located in the Equipment Room to each camera. Complete cabling & cabling accessories are in the scope of bidder. Bidder shall provide interface equipment between the CCTV cameras and video unit equipment. This interface equipment shall allow video from each camera to be transmitted to CR.

4. Bidder shall provide all the interfacing hardware and software necessary with this equipment to enable control room operators and maintenance personnel to monitor and control all cameras of the facility.

5. Mounting of fixed & PTZ cameras shall be engineered and provided on structures /poles. Poles shall be designed as per IS 875.The scope includes supply, erection and installation, supply of suitable brackets / stands , wiring , necessary civil works, etc, In case existing or new structures is available then cameras shall be installed on it. The mounting location need to be firmed up during detail engineering.

6. The CCTV system cabinet shall be in control room of location suggested in Particular Job specification / MR. These are indicative & attached to facilitate the bidder during bidding process. Successful bidder shall have to prepare the drawings for CLIENT/MECONs' approval. Tenderer to submit the drawing indicating the location of Cameras considered covering the entire area as spelt out in system architecture.

7. The CCTV system shall be based on IP Network (LAN) and shall possible for viewing at 4 CIF as a minimum & of 1.0 mega pixel as maximum resolution and recording of video at 4 CIF and configurable FPS based on camera locations with H-264/MPEG-4/ MJPEG compression format. The total storage capacity of minimum 24 TB (or as per sizing & storage for 30 days).

8. Selection of camera to view on the monitor shall be through client workstation.

9. All software and firmware upgrades shall be free of charge during the Warranty and AMC period. Vendor should ensure backward compatibility with all the hardware and other software.

10. The warranty shall consist of repairing/replacing defective parts for a period of 2 years (24 months) from the date of acceptance by client or as define in tender.

11. Monitoring and Control System

NVR MS units with control unit shall be located dedicated control room. The units shall be able to select and control any camera on the system, either individually or as a mosaic of the total camera system. It shall be possible to prioritize the keyboards.

The control of video selection and camera control shall be microprocessor based to maximize system flexibility. It shall be possible to preset camera zoom settings and to return to these from the control units.

All video sources shall be synchronised to prevent frame roll and colour shift on camera switching. Adjustable conditioning shall be incorporated as necessary to correct impairment, which may be introduced by cables from the central equipment to the cameras in the field positions at the facilities.

12 Camera Housing & mounting:

The camera mount should be of the same make as that of camera and suitable for the model number offered as specified by the manufacturer and should be an integrated unit. It should be compact and indoor / outdoor type as required. It should support the weight of camera and accessories such as housing pan & tilt head in any vertical or horizontal position etc.

Speed dome controller / PTZ controller

Speed Dome Controller should have variable speed joystick, LCD display for programming and it should be able to control the speed dome for PAN *1* TILT *1* Zoom.

3.6.7 FUNCTIONALITIES:

The minimum functionalities of the CCTV Surveillance system shall be as under:

b) **Viewing:** The system shall provide the following viewing functionalities as a minimum:

Live Video: The live output from cameras shall be viewed on LED TVs connected to Client Machines. These shall support Single camera view and Quad view of up to sixteen cameras in 4X4 matrix. All the cameras in the view shall provide simultaneous live streams.

Also the software should support viewing in 2X2 matrix with software configurable manner; Sequence viewing of camera preset positions; Modifying settings for a camera; Modifying recording settings for a camera; Adding and deleting cameras; Creating schedules for recordings and video motion detection; Monitoring of multiple alarms, Modifying Video Analytics settings and tuning for: Video Motion Detection / Object Classification etc. Users shall be able to select a camera from a tree control listing the cameras available to the user.

(i) ***Single Camera*:** With this functionality, the user shall be able to:

- View the live output from any selected camera;
- Pan, tilt, zoom and focus any PTZ camera using a joystick / Software at the Client PC/Server;
- Manually record live video.

(ii) ***Quad View:*** With this functionality, the user shall be able to view in 2x2 or 4x4 view. A quad view consists of cameras viewed simultaneously on a single display. The quad view shall be

divided into four quadrants. For each quadrant the quad view shall have number of cameras or be blank. Within each quadrant the quad view shall be configured to cycle between any of the cameras accessible to the user on a configurable time basis. Any Camera can be assigned to any quad.

(iii) ***Sequence View*:** With this functionality, the user shall be able to view cameras in sequence. A sequence view consists of a single camera view, which can be cycled on a time basis. Pan-tilt-zoom cameras, which support preset positions, can have these presets cycled on a time basis. In this way an operator can view a variety of presets on a series of PTZ cameras. Fixed cameras can also be included in the sequence and cycled accordingly. There shall be no limit to the number of cameras that can be assigned to a single Sequence View. There shall also be no limit to the number of available Sequence Views. Each salvo should be made available for a specified length of time.

c) **Camera settings:** Through this functionality the users shall be able to configure all settings for all cameras in the network. The configurable settings shall be minimum:

(i) *Camera Details* (Name, Location, Description, Camera ID, Frame-rate, Unicast/Multicast transmission of video etc.);
(ii) *Camera Connection* (Pan speed, Tilt Speed, Zoom speed, Focus speed, Iris speed etc.);
(iii) *Camera PTZ Control*;
(iv) *Security* (Control Level, Control Reservation Period etc.);
(v) *Camera Deletion*

d) **Recording:** Through this functionality the users shall be able to record live video in following methods:

(i) ***User activated*:** With user-activated recording, the user shall be able to record video streams with various configurable parameters for any camera like: Pre-Record Duration, Frame Rate, Record Duration, Retention Period etc.

(ii) ***Event activated*:** With event-activated recording, the system shall be able to automatically record video streams from any camera on reporting of any pre-defined event or alarm. In this, user can configure various parameters like: Pre-Record Duration, Post-Record Duration, Frame Rate, Retention Period etc.

(iii) ***Scheduled*:** The system shall have the ability to schedule recordings for each individual camera for times in the future. For each scheduled recording the user shall be able to configure the following:

- Start time
- Stop time
- Frame rate for the recording
- Retention period before the recording will be deleted
- Recurrence (if this is to be a recurring schedule)
- Description

There shall be no limit on the number of schedules that can be entered for the system. There shall be no limit to the number of schedules per camera.

(iv) ***Video motion detection activated:*** The system must have the ability to record video streams based on video motion detection algorithms; the motion detection functionality can be achieved from the Cameras or Servers on continuous or scheduled manner.

e) **Snapshot:** The system shall provide every operator (client) with the ability to record the current frame of video. This snapshot of video shall be stored as a bitmap file. The file name shall be

automatically generated by the software and include the camera name, date and time of the recording.

f) **Alarm Handling:** The system shall support the following alarm-handling features:

(i) Alarms categorization – logs, warnings and alerts
(ii) Manual and auto alarm acknowledgement
(iii) Alarms stacking / queuing
(iv) User configurable alarm handlers
(v) Generation of Email / SMS for alarm reporting
(vi) FTP upload
(vii) Alarm video clip recording
(viii) Alarm image recording

g) **Search:** The system shall provide a simple search for all video recorded. The search shall be based on minimum:

(i) Camera based search
(ii) Time based search
(iii) Event based search

It shall also include any cameras including those that might have been deleted from the system but still have video stored on a Camera Server or on archived media. The time criterion shall be selected from a calendar and time line control.

The software shall be able to generate reports with images and videos, Charts and graphs etc. The system should also support generation of reports that can also be exported to XML / CSV / PDF formats and it shall also be possible to generate automatic periodic report.

h) **Viewing Recordings:** The system shall make available recorded video to all clients, which have adequate security. Each user shall only be able to view recordings from cameras they have security access to view. A display shall be provided to view recordings from any Operator Station. From this display, the operator can select the recording he/she wishes to view, which shall be immediately shown in an embedded video player. System should be capable of providing facility of viewing, recording & replaying simultaneously without compromising the quality.

i) **System and User Audit Trail:** System shall have the capability that all user actions on the Operator Station be recorded in a log file along with the Security System. System should ensure that once recorded, the video cannot be altered, ensuring the audit trail intact for evidential purpose. This log must also contain a history of the status of the system components. It shall list the status of all cameras, streamers, servers and other system components including when they were disabled or failed. The log of user and system actions shall be available in text format and automatically included with any video recordings that are exported.

j) **Storing & Archiving:** The system shall include an online storage for maintaining minimum Video stream recording from individual cameras on respective NVR/Camera Server & subsequently archived to NAS storage device. The NVR/Camera Server shall store 1 day's recorded Video stream from all the CCTV Cameras (installed + 25% more) on continuous basis for the PTZ Cameras and on motion-detection basis for the Fixed cameras at any resolution up to its maximum resolution as mentioned under Technical Specifications @ 15 FPS frame rate and subsequently shall be archived to NAS storage device. The NAS storage shall have capacity of archiving minimum 30 days recording from all the CCTV Cameras (installed + 25% more) on continuous basis for the PTZ Cameras and on motion-detection basis for the Fixed cameras at any resolution up to its maximum resolution as mentioned under Technical Specifications @ 15 FPS. System shall have provision to automatically over-write the new information after the period of 30/31 days in FIFO manner & necessary script/algorithm must be available in the application.

k) **Additional Functionalities / Features:** In addition to above mentioned functionalities, the following functionalities shall also be supported by the system:

(i) Support for numerous third-party applications and plug-ins to provide a broad range of integration options including access control, analytics tools, central monitoring, alarm handling etc.
(ii) Supports up to five concurrent users and licensed to grow.
(iii) Bandwidth usage indicator
(iv) Independent layout settings for each screen
(v) Instant replay
(vi) Magnifying glass
(vii) Interactive digital PTZ
(viii) Video overlay text
(ix) USB/Network-based joystick support
(x) Automated daily reports e-mailing
(xi) Video navigation - play, pause, up to 16X fast forward and up to 16X rewind in multiple steps
(xii) Automatic optimization option in server to lower resource usage, after the settings are done.
(xiii) Diagnostics parameters display
(xiv) Watchdog to monitor system & application health

3.6.8 CAMERA SPECIFICATION

1) PTZ type

a. General

Camera shall be IP network based color day/night camera suitable for indoor & outdoor application to be installed in safe area with following minimum features:

- Networked dome camera for remote pan/tilt/zoom control with10/100 Mbps Ethernet with Cat -5e/6 cable.
  Pan Range: 360 degrees Tilt Range : 0-90 Degree (w/o Auto-Flip)
- Motion MPEG-4 and H.264 based hardware compression
- Direct IP based (without external converters, cards, etc)
- Compression: H.264, 4CIF@25 frame/sec
- Interlace scan
- Wide dynamic range
- Power over Ethernet (for outdoor cameras at SV stations, 24 VDC power will be available. Vendor shall provide power convertor required, if any
- On Board Analytics viz. Motion Detection, No Motion Detection, Congestion, Dual Trip Wire, Object Classification, etc
- The housing shall be :
- Imager :1/4" Progressive Scan Ex View CCD
- Supporting Protocols: IPv4/IPv6, TCP, UDP, ICMP, IGMP, HTTP, HTTPS, FTP, SMTP, DHCP, DNS, NTP, RTSP/RTP/RTCP, SNMP
- SNR: >=50db

b. Connections

Network interface: IEEE802.3, 10/100 BaseT Ethernet networks (RJ45) for LAN/WAN, TCP, UDP, IGMP, SNMP, HTTP, RJ45

c. Video

Lens: Autofocus 35x Optical Zoom,
F1.6(W) to F4.5(T);
Focal length: 3.4 to 119mm

Zoom: min 24 x optical +min 12x digital
Pan: 360 degree (continuous rotation)
Tilt: 90 degree above horizontal & 90 degree vertically down
Frame: 25 fps or better
Resolution: better Min. 540 TVL [Effective Pixel: 752 (H) X 582 (V)]
Light sensitivity: 0.55 Lux color min., 0.01 Lux B/W min.
IR sensitive black/white video at night
Video compression: H.264 (MPEG-4 Part 10)
Angle View: 55.2° (Wide) to 1.7° (Tele) or better
Shutter Time: PAL: 1 - 1/10000s
Presets: 64
Motion Detection: Available on the entire Camera Capture Frame
PTZ Cameras shall have 64 or more pre-defined positions, to be selected through suitable input command

d. Functions

- Backlight compensation
- Motion detection
- Scheduled and triggered event functionality with alarm notification
- Pre and post alarm buffer
- Digital time, date code embedded
- Password protection
- Other Features: Programmable Tours, Programmable Auto Pans, Privacy Zones/Video Blanking Sectors, E-flip/Auto-flip, EIS.
- Certifications: FCC or CE and UL

e. IR Illuminator

IR illuminators of following specification to be provided by vendor along with each camera:

- LED based for minimum 30 meters,
- Automatic Dawn/Dusk power on/off
- For outdoor application with power supply IP-66 protection
- Outdoor with temperature range up to 55°C,
- Minimum Illumination: Color Mode: 0.1 Lux @ 50IRE, F1.6 Black & White: 0.0001 Lux @ 50IRE, F1.6

f. Software : Latest Window, XP

g. Operating condition
Outdoor with temperature range upto 50 °C
a) IP-66/NEMA-4X and Vandal –resistant for hydrocarbon-safe area.
b) IP-66/NEMA-4X and intrinsically safe (ATEX compliant) ATEX-Certified for zone 0/1/2(class-I Division-1/2) area.

2) FIXED TYPE

a. General

Camera shall be IP based network color camera suitable for indoor & outdoor application to be installed in safe area with following minimum features:

- Motion JPEG or MPEG-4 based hardware compression with built-in web server

- Direct IP based (without external converters, cards, etc)
- Zoom and auto focus
- Local Storage
- Power over Ethernet
- HDTV quality
- Intelligent video capabilities
- Housing: Vandal-resistant Housing
- Imager : 1/3" Progressive Scan Ex View CCD or CMOS
- Protocols: IPv4/IPv6, TCP, UDP, ICMP, IGMP, HTTP, HTTPS, FTP, SMTP, DHCP, DNS, NTP, RTSP/RTP/RTCP, SNMP
- Certification: FCC or CE and UL

b. Connections

Network: 10/100 Mbps Ethernet with Cat-5e/Cat -6 cable
Video
Lens: Fixed, F1.2, f=3.0-9.0mm
Focus range: 0.3 m to infinity
Progressive scan CCD
Light sensitivity: 0.65 lux color
IR Illuminator with sensitive black/white video at night
Frame: 25fps or better
Night View: 0.05 Lux
Day/night Mode feature: Yes [Configurable & Automatically selectable]
Maximum Resolution: 1080P (1920×1080) @25fps

c. Functions

Built-in video motion detection on the entire Camera Capture Frame
Scheduled and triggered event functionality with alarm notification
Pre and post alarm buffer
Digital time, date code embedded
Password protection for restricted camera access
Privacy Mask shall be Available
Power Supply: PoE IEEE 802.3af Class 2 / 24V AC / 12V DC

d. Software
Latest Window, XP

Operating condition

Outdoor with temperature range of 0-50 °C

- Apart from above-mentioned minimum specifications, all types of cameras shall also comply the followings:
  (a) Camera Web server: The IP Camera will have a built in web server, making it accessible for configuration using a standard Internet browser.
  (b) Security: Password protected Web interface for administration.
  (c) Alarm: Must have 2opto-isolated alarm inputs and 1 relay outputs.

- If the cameras & software (VMS / VAS) are from different OEM, certificate from both the OEMs in regard to seamless integration & operation of the total system to be ensured.

- Camera Housing & mount: The camera mount, power supply, housing, lens should be:

(a) Of the same make as that of camera or from OEM-approved firms and suitable for the model number offered as specified by the manufacturer and should be an integrated unit.

(b) Should support the weight of camera and accessories such as housing, pan & tilt head in any vertical or horizontal position etc.

(c) Outdoor PTZ Cameras shall be mounted on polls. All the associated items like Power-Adapters, Media-Converters etc for the particular camera shall be housed in Weather-proof/Intrinsically Safe Junction-box as per site requirement) beside the pole. Uninterrupted Power Supply for the Camera shall be extended from the nearest point.

6.6.9 NETWORK VIDEO RECORDERS (NVR)

NVR shall be a fully IP based integrated Network Video recorder with network video management software, Video Analytic software and IP cameras management suitable for all IP cameras with spare capacity. The NVR shall be located at Server locations defined in MR/PJS. The NVR must be able to connect to all network-connected devices. The video recording servers shall have disk space for online video storage and high capacity archiving mechanisms for the removal of stored video to off-line media. Number of server machine shall be selected based on the smooth functioning of all the cameras network video management, Video Analytic operations. If required additional machine has to be supply. IP cameras shall be integrated with NVR server (IP based).

The NVR shall have the following as a minimum;

- Automatic IP camera discovery and configuration
- Software RAID with 24/7 operation
- Receive encoded live video from IP cameras, Play back video while still recording from the same camera, Store live video to hard disk, Archive previously stored video to off-line storage media, anywhere, anytime.
- Allow alarms/events to initiate recordings
- Scheduled recordings
- Initiate recordings based on video motion detection (on a continuous basis & scheduled for particular times, days, months, etc)
- Report any IP camera failure or recoding failure to the system
- Provide a full log of all system status (camera, server availability, etc)
- Search for recordings (by camera & time, by motion detection, by alarms/events)
- Network management with Security with passwords for each camera.
- Thumbnails of recordings & exporting of recordings into CDs & DVDs & printers.
- The system shall support an unlimited (thousands of IP cameras) and video recording servers & with unlimited license.
- Support full frame rate on all inputs from the IP network cameras.
- Software shall have a provision for Q-CIF, 2CIF and 4CIF configuration.
- Interfaces with IT industry Standard Hardware
- Processors: Six-core Intel® Xeon® E5-2430 2.20GHz, 15MB Cache or better
- Memory: Minimum32GB (4X8 GB) DDR3 @ minimum 1333MHz
- Graphics Card: PCI Express 1920X1080 Graphics with minimum 2 GB Video Memory
- Hard Disk Controller: Integrated Hardware based 8-port hot-swap SAS-RAID controller for supporting up to 8 HDDs in RAID-0, 1, 1+0, 5.
- Hard Disks: 7.2krpm SAS hot-plug HDD or better totalling a capacity as per requirement
- Optical Drive: 16X DVD ± RW
- Ports:1 serial port, 4 USB port or higher(other than the requirement of connecting key board and mouse) and other I/O ports to connect to Storage (if required)
- PCI/PCI-e Slots:Total 6 or more PCI/PCI-e type slots. With Min 4 to be free for future expansion

- Communication : Minimum Two dual port embedded Broadcom® NetXtreme® II 5709c Gigabit Ethernet NIC or better with failover and load balancing.
- Server Management Software :OEM Server Management software to monitor and manage the various subsystems like CPU, Memory, I/O , disk and environmental factors
- OS :Windows 2008/20012 Server with Antivirus provisioning or Linux
- Power supply:1+1 or higher

Suggested make of NVR / CAMERA SERVER: CISCO / Dell / HP / IBM / Oracle (Sun)

Video management software should have following features:

- It should have open architecture.
- It should be capable of providing web based access
- Open license to be provided along the software as define

The NVR may be integrated with Administration server or may be separate servers. Administrators shall be able to view camera details, change camera settings and configure video settings.

The NVR should have capability of connecting to all the IP cameras in its region as well as further connectivity with the NVR. In addition to the NVR screens, separate screens shall be provided for Alarm monitor.

Alarm monitor: when an alarm occurs in the NVR/Administration server, the live video output of the camera associated with that alarm should be switched directly to the alarm monitor.

Bidder scope includes supply and installation of NVR workstation for viewing all CCTV cameras connected with attended & unattended station simultaneously on monitors of 60" size and separate 21"/22" for alarm monitor).(or as specified in PJS /MR)

NVR hardware along with suitable A4 color laser printers shall be provided.

- Storage of 40 TB SCSI each (RAID 5 HDD set)
  or 30 days backup of total quantity with spare and 25 % future capacity
- Fault tolerance for RAID video recordings, operating system.

View options

- Single camera view
- 1x1 upto 8x8 camera views
- Sequence view
- Map view.

3.6.10 CCTV CLIENT WORKSTATION

CCTV Client shall include the minimum features as below:

- Installed per default on Recording Server for local viewing and playback of video and audio.
- Start recording on cameras for a pre-defined time (default 5 minutes). Subject to privileges set by administrator.
- Live view digital zoom shall allow zoomed-out recordings while the operator digitally can zoom in to see details.
- Shared and private camera views offer 1x1 up to 8x8 layouts in addition to asymmetric views.
- Multiple computer monitor support with a main window and any number of either windowed or full screen views.

- CCTV Client shall allow a specified view to rotate between pre-defined cameras with individual timing and order with multiple appearances.
- Matrix function to view live video from multiple cameras in any view layout
- Cameras' built-in audio sources shall available in live and in play-back.
- CCTV Client shall transmit client microphone input to one or all-remote speakers attached to IP devices.
- Go to PTZ preset positions directly from camera menu.
- Send wipe and wash commands to supported PTZ by programming keyboard shortcuts
- Go to a specific camera directly from camera menu.
- Copy camera images to clipboard.
- Manually trigger events by activating an administrator defined event from a list.
- Audible alerts activated by motion detection or event occurrence per camera.
- Smart Search shall let quickly search-selected areas of camera images for motion. Within a camera image, shall mark a specific area, multiple areas or overlapping areas for detecting motion sequences.
- Graphical timeline shall display scrollable view of recorded sequences by adjustable time spans for an excellent graphical overview of when images have been recorded.
- AVI export automatically shall include assigned audio source.
- Encryption & password protection option for exported recordings and files when exporting to database format.
- Assign outputs, PTZ presets, events and views as actions to joystick buttons and as Keyboard shortcuts
- Hide HTML page toolbar in HTML page views.
- Current camera state shall be displayed as text in title bar of live view item window as green (live), red (recording) or yellow (stopped).
- Video quality shall be optimized when maximizing live and playback windows.

3.6.11 NETWORK ATTACHED STORAGE (NAS) / RAID BACKUP DEVICE

- NAS box/RAID backup device shall be used to record video streams based on the configuration assigned by administrator. Workstations & Servers within the LAN should be able to access the recorded video streams. The NAS / RAID backup device should support simultaneous play back and recording at full duplex operation.

- It shall provide a high quality recording storage and play back of images. It should support integration with LAN to provide Centralized Management and shall operate on Windows I Linux 0s. Support of user management for security level control and authentication required.

- All the common & critical components of the storage device, like Controller/CPU, Memory, Network Connectivity, Power Supply Units, Cooling Fans etc. shall be hot-swappable and shall have 1+1 redundancy for automatic failover without any service degradation and no single point of failure shall be there leading to total failure of the storage. Hard-disks shall have redundancies in the form of RAID-6 deployments.

- All licenses & all the features / facilities shall be provided.

	Description	Minimum Specification
	Required Capacity	The storage capacity should meet the requirement of storage of video recordings from all the cameras (present requirement + mandatory spare and 25 % more of total) recordings for a minimum period of 3**0 days** @ 15 FPS or less as per site requirement, at their best resolution & quality (as mentioned under technical specification of Cameras) or less using necessary compression techniques (H.264 or better) for all cameras. Please refer the Note below to have a basic guideline for requirement of Storage capacity per camera. It should be 40 TB or higher as per above calculation.
	HDD type supported	Array should support 15k, 10krpm of SAS drives and 7.2k rpm of NL-SAS/SATA drives (maximum HDD capacity of 2TB each).
	Min. System Memory of server machines each	2 TB
	Storage Controllers	➢ Dual controllers operate in an active-active environment mirroring each other's cache ➢ Cache protection shall be provided for at-least 72 hours with battery-backup or via flash memory for permanent data protection
	LED Indicators	There shall be sufficient LED indicators for any activity or fault in any hardware component on the storage including Hard Disk, Controller, Power Supply, Fan module etc.
	Remote Management	Should have separate GbE port for remote management. Storage Management software shall also be provided.

For calculating the storage following shall be considered for 30 days storage of all the cameras of present requirement as per MR plus mandatory spares and 25 % future of total quantity for future:

- Frame Rate: 15 FPS
- Compression Technique: H.264
- Resolution (PTZ) : mimimum 752 x 582, appx bandwidth 1000 kbps or more (by OEM)
- Resolution (Fixed) : mimimum 1920 x 1080 appx bandwidth 3320 kbps or more (by OEM)

Suggested make of NETWORK ATTACHED STORAGE (NAS):

Dell / EMC / Fujitsu / HP / Hitachi / IBM / NetApp / Oracle (Sun)

CCTV Monitors may be installed at desktop or on wall as per site requirements. Size will be 60" for viewing and 22"/21" for Alarm.

Three copies with ONE ORIGINAL license for software shall be provided in CD/DVD for NMS CCTV and same shall be installed in LCT also. The quantities of LCT shall be as per SOR.

Workstation (minimum), NVR / Camera / Database Server (minimum) or better

- Intel core i7 3770 Quad Processors with clock speed- minimum 3.4 GHz or higher
- 2 MB Cache or better Mother Board Intel
- Memory 16 GB DDR3 DIMM Memory, 1600MHz, ECC (4 X 4 GB DIMMs) DDR3 RAM 1066/1 333 MHz 8 GB expandable (for server as define above clauses)
- Hard Drives 2X500 GB or more (for server as define above clauses)
- Mouse Optical
- Video Card In Built 2 Nos for connecting 2 monitors

- RAID Supported
- Network Adapter (NIC) Integrated 2X 1000 Base –T Ethernet
- Sound Card In- Built
- DVD writer read function
- USB at front panel
- Operating system MS Windows OS or Linux (Latest versions) at the time of tender
- Antivirus Software Latest software with online support for three year.
- Graphics Card: 2 X 2GB Graphics Cards for supporting & connecting Monitors
- I/O Ports: 8 USB Port, 2 HDMI, Console
- Other devices: 16X Internal DVD RW
- OS: 64 Bit Windows 7 /8 Professional with Anti-Virus provisioning
- USB Membrane / Internet / bilingual keyboard, USB 2 button optical / scroll mouse
- Speed 25 fps / channel (minimum 32 channel)
- USB at front panel
- Keyboards PS/2 Keyboard
- Mouse Optical Mouse with scroll
- Operating system MS Windows OS or Linux (Latest versions) at the time of tender.
- Antivirus Software Latest software with online support for three year
- One with each client work station for camera control

LAYER 2 ETHERNET SWITCH

Vendor shall deploy Layer-2 Ethernet Switch for setting up the Ethernet backbone for connectivity to CCTV Cameras and to powering up them (if required).
The technical specifications of this type of Switches shall also include but not limited to the following:

(i) Operational Temperature: 0^0C to +70 ^{0}C
(ii) Humidity: 05 % to 95 % non-condensing
(iii) Input Power Supply: 220V AC [Maximum 500 watts]
(iv) Network Module with minimum 2nos of SFP for Single-mode Optical Fibres for supporting 10 Gbps backbone-link/uplink.
(v) 10/100/1000 Autosensing Ethernet ports (RJ45) : 24 ports (all ports equipped With PoE IEEE 802.3af Class 2)
(vi) Should be IPV4, IPV6 Compliant from Day One
(vii) **Performance:**
- Should support non-blocking wire speed performance with minimum 100 Gbps switching bandwidth & minimum 60 Mpps forwarding rate;
- Should support minimum 4000 MAC address and minimum 1000 VLAN.
- Should support Jumbo Frame, Port Mirroring, and Broadcast Storm Control etc.
- Should support Multicast [Minimum supported Multicast Grobackup: 1000]

(viii) **Supported Standards:**
- IEEE 802.1D Spanning Tree Protocol
- IEEE 802.1p CoS Prioritization
- IEEE 802.1Q VLAN
- IEEE 802.1s
- IEEE 802.1w
- IEEE 802.1x/IEEE 802.1x-Rev.
- IEEE 802.3ad
- IEEE 802.3ae
- IEEE 802.3af
- IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 1000BASE-T ports
- IEEE 802.3 10BASE-T specification

- IEEE 802.3u 100BASE-TX specification
- IEEE 802.3ab 1000BASE-T specification
- IEEE 802.3z 1000BASE-X specification
- IEEE 802.3x Flow Control

(ix) **Management Featured:**

- Supporting SNMPv1, v2 and v3
- Supporting IGMP v1 / v2 / v3 snooping to optimize Multicast Traffic
- Supporting Web Based and CLI based management
- Should have DHCP client
- Should support file upload using TFTP, FTP, SFTP, or SCP for faster configuration

(x) Should have Monitoring & Trouble-shooting features enabled.

(xi) Should have appropriate Security Features enabled through: (i) detection of ARP floods, (ii) detection of packets with invalid Source / Destination IP Address or (iii) detection of multicast packets etc.

LAYER 3 ETHERNET SWITCH

Vendor shall deploy two numbers of Layer-3 Ethernet Switches for Ethernet interconnectivities between IP CCTV Cameras and all Server/Storage/Client machines etc. At the same time, the same shall also be used for extending/integrating IP connectivity to other IP network. The technical specifications of this type of Switches shall also include but not limited to the following:

(i) Operational Temperature: 0.0C to +35 0C

(ii) Humidity: 5 % to 95 % non-condensing

(iii) Input Power Supply: 220V AC [Maximum 1000 watts] with redundant power- supply.

(iv) Network Module with minimum 8 nos. of 10 Gbps Ethernet SFP based interfaces to be used with Single mode Optical Fibres cable.

(v) 10/100/1000 Bate-T Autosensing Ethernet ports (RJ45) : minimum 16 ports

(vi) **Performance & Features:**

- Should support Wire speed non-blocking switching
- Should support non-blocking wire speed performance with minimum switching capacity of 300 Gbps& minimum 250 Mpps forwarding rate;
- Should be IPV4, IPV6 Compliant from Day One
- Should support minimum 4000 MAC address and minimum 1000 VLAN;
- Should support Jumbo Frame, Port Mirroring, and Broadcast / Multicast/ Unicast Storm Control.
- Should support Multicast [Minimum supported Multicast Groups: 2000].
- Should support LLDP-MED.
- Should support port-mirroring.
- Should support L-3 redundancy features (VRRP for IPV4 & IPV6)
- Should support both static and dynamic link aggregation & Load balancing
- Should support CoS&DiffServ.
- Should support Standard and Extended Access control list for both IPv4 / IPv6: Access control list with IP based ACL, MAC Based ACL and IP + MAC combination based ACL, time based ACL etc.
- Should be IPv4 / IPv6 ready (dual stack) supporting Static routing & Dynamic routing protocols (OSPF & BGP) for IPv4 and IPv6.
- Should support iSCSI connectivity.

(vii) **Supported Standards:**

- IEEE 802.1D Spanning Tree Protocol

- IEEE 802.1p CoS Prioritization
  IEEE 802.1Q VLAN
- IEEE 802.1s
- IEEE 802.1w
- IEEE 802.1x/IEEE 802.1x-Rev
- IEEE 802.3ad
- IEEE 802.3af
- IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 1000BASE-T ports
- IEEE 802.3 10BASE-T specification
- IEEE 802.3u 100BASE-TX specification
- IEEE 802.3ab 1000BASE-T specification
- IEEE 802.3ae
- IEEE 802.3z 1000BASE-X specification
- IEEE 802.3x Flow Control

(viii) Management Featured:

- Supporting SNMPv1, v2 and v3
- Supporting IGMP v1 / v2 / v3 snooping to optimize Multicast Traffic
  Supporting Web Based and CLI based management
- Should have DHCP client
- Should support file upload using TFTP, FTP, SFTP, or SCP for faster configuration

(ix) Should have Monitoring & Trouble-shooting features enabled.

(x) Should have appropriate Security Features enabled through: (i) detection of ARP floods, (ii) detection of packets with invalid Source / Destination IP Address or (iii) detection of multicast packets etc.

CAT 6 Cable

4 Pair Twisted Cable
Support for Fast and Gigabit Ethernet, IEEE 802.3/5/12, Voice, ISDN, ATM 155 & 622Mbps and other applications.
Physical Specification :
Conductor : 23 AWG Annealed bare solid copper
Insulation : High Density Polyethylene
Core Colour : -
Pair 1 : White - Blue
Pair 2 : White - Orange
Pair 3 : White - Green
Pair 4 : White - Brown
Sheath : Fire Retardant PVC Compound (FRPVC)
Should be Tested upto 250Mhz
4 twisted pairs separated by internal X shaped, 4 channel, polymer spine / full separator. Half shall not be accepted.
Approx. Cable OD : 6.2 mm
Sheath Colour : Grey

Operating Environment : Indoor
Flame Rating : 60 deg.C As per UL 1685 CM
UL Listed and ETL Verified
Electrical Specification :
Standards : TIA / EIA 568 B.2-1, TIA / EIA 568 C.2
Impedance : 100 Ohms +/- 15%
(NVP) Velocity of Propagation : 70% min. @ 250 MHz Approx
Delay Skew : 25 ns /100 mtrs. max. @ 20 deg. C, for 1 MHz~250 MHz Approx.
Propagation Delay : <=498 ns / 100 mtrs. max. @ 20 deg. C, @ 250 MHz
DC Resistance: <= 9.38 ohm / 100 mtrs. max. @ 20 deg. C
Mutual Capacitance: 5.60 nF / 100 mtrs. max. Approx

5.22 Fibre Patch Cord

Fibre Patch Cord
SC-SC / SC-LC patch cord should be of minimum 3 meters length suitable for nominal wavelength of 1310nm and 1550nm.
9/125 micron SM fibre
Connector Ferrule: Zirconia Ceramic
Dust caps shall be fitted on each connector at the assembly.
Thickness of patch cord cable should be 3 mm nominal.
Insertion loss should be nominal 0.1 dB per connector
Return loss should be better than 45 dB.

- **Suggested makes of CLIENT WORKSTATION:** Dell / HP / Lenovo

- **SUGGESTED MAKES OF CCTV CAMERAS:** American Dynamics / Infinova / Vicon / Axis / Indigo Vision / Sony / Panasonic / Bosch / Pelco / Honeywell / DVTel / Mobotix / [Approved Make of VMS / VAS OEM (Cisco / Genetec / Milestone / MindTree / Mirasys / NICE / UltraIP / Verint / i2V / Video IQ / Mate / Object Video / Agent VI / NICE / Verint / iOmniscent)]

- **SUGGESTED MAKES OF VMS:** Cisco / Genetec / Milestone / MindTree / Mirasys / NICE / UltraIP / Verint / i2V / Approved Make of Camera-OEMs [American Dynamics / Infinova / Vicon / Axis / Indigo Vision / Sony / Panasonic / Bosch / Pelco / Honeywell / DVTel / Mobotix]

- **SUGGESTED MAKES OF VAS**: Video IQ / Mate / Object Video / Agent VI / NICE / Verint / iOmniscent / Approved Make of Camera OEMs [American Dynamics / Infinova / Vicon / Axis / Indigo Vision / Sony / Panasonic / Bosch / Pelco / Honeywell / DVTel / Mobotix]

3.6.11 TEST INSTRUEMNTS:

The following shall apply for the Test Instruments.

All accessories shall be procured and supplied from the respective test equipment manufacturer, including necessary, interfaces, connectors, cables, patch cords, jumpers, batteries, adapters,

spares, lamps, fuses, carrying cases etc., which shall be supplied along with each instrument as a single package from each test instrument manufacturer.

These test instruments shall be suitable for the telecommunication system offered and shall include factory testing and training at test instrument manufacturer facilities or at authorized service centers in India. The quotation shall contain make and model & detailed specifications for each instrument.

The test instruments shall operate on 230V, 50 cycles per second AC power supply and/or built-in rechargeable batteries.

The built-in battery operated hand-held test instruments should be capable of working in the field for 2 Hour minimum.

Vendor shall provide requisite charger (charging at 230 VAC) along with respective test instruments and one spare set of batteries along-with respective hand-held instruments.

Calibration certificates shall be provided for each test instrument conforming to its traceability.

All test instruments shall meet rigorous environmental tests including shock & vibration.

The following test instruments shall be provided:

1) <u>DIGITAL MULTIMETER</u>

- Measurement of AC voltage (+/-0.7% accuracy), DC voltage (+/-0.05% accuracy), resistance, AC current (+/- 1.0%accuracy), DC current (+/-0.2% accuracy), temperature.
- 4-1/2 digit LCD display.

2) <u>OTDR (OPTICAL TIME DOMAIN REFLECTOMETER)</u>

Base Unit Requirements

- Test Equipment Configuration
- The mainframe shall accept at least two modules simultaneously.
- The Test Equipment shall be field upgradeable
- The modules shall be field interchangeable
- The Test Equipment shall be battery operated in any configurations.

Display

- The size of the display shall be minimum 6.4".
- The Test Equipment shall have a LCD color display with high visibility for outside plant use. The Test Equipment shall therefore be usable in direct sunlight.

Field operation

- The Test Equipment shall be portable, battery operated and rugged for field operations.
- The weight of the Mainframe shall not be higher than 5.5 kg with one function module.

OTDR Measurement Capabilities

- Wavelengths: 1310 +/-20nm, 1550 +/-20nm & 1625 nm
- Laser Safety: Class 1

- Distance accuracy: +/- 1m +/-10-5x distance +/- sampling resolution (excluding group index uncertainties).
- Vertical linearity: +/- 0.05dB/dB
- Distance sampling: minimum 4cm
- Number of data points: minimum 65000 acquisition points
- Real time sweep: 0.1 s

Test Functions and Features:

- The OTDR must have a one button operation mode.
- The OTDR must give an indication of the quality of the front connection
- The OTDR shall display the type of event:

i) The Distance, the Loss and the Reflectance of each event
ii) The Slope of the fiber.
iii) The fiber Total Loss and Optical Return Loss.

- The OTDR shall indicate ghost detections on the trace and in the table of events. This shall be user-selectable.
- Comments shall be available and linked to each event of the table
- Part of the screen must be reserve to display the trace to locate the events.
- The Event table must be linked to the trace.
- The OTDR must have a function which positions automatically the cursor on the successive events.
- The OTDR must have a function to freeze the markers for repetitive acquisitions.
- The OTDR shall overlay minimum 8 traces:
- Overlay current trace versus saved traces.
- Overlay multiple wavelengths.
- It shall be possible to toggle from one trace to the other.

The OTDR must have the capability to process automatic bi-directional measurements.

The OTDR must check automatically fiber continuity

The measurement parameters from the main instrument must be transferred automatically to the other instrument to avoid any operation error.

It must be possible to visualize the trace from one instrument, from the other instrument, or both superposed and the results at the same time

OTDR Module for long haul testing

Event Dead Zone: (Measured at +/-1.5dB down from the peak of an unsaturated reflective event)

at 1310nm: 4m

at 1550nm: 4m

Attenuation Dead Zone: (Measured at +/- 0.5dB from the linear regression using an FC/APC type reflectance)

at 1310nm: 15m

at 1550nm: 15m

Dynamic Range: (The one way difference between the extrapolated backscattering level at the start of the fiber and the RMS noise level)

at 1310nm: 42dB

at 1550nm: 40dB

The optical time domain reflectometer (at 1310nm/1550nm) should have a dynamic range >/= 25 dB, accuracy better than +/- 0.05% of length measured. Suitable printer shall be supplied with OTDR.

3) LASER SOURCE & POWER METER (HAND HELD)

I. Optical Laser Source:

Basic requirement of optical laser source:

The optical source will be applied for loss/attenuation measurements during installation, operation and maintenance of fiber optic networks. It will be operating in conjunction with an appropriate power meter.

The source has to simulate the system parameters, so laser sources are preferred operating at 1310 and 1550 nm, coupling the output power into a SM-fiber 9/125 µm.

The instrument has to withstand all practical environmental conditions like temperature, shock, bumps etc. The instruments shall use standard AA batteries –dry cells and it should be easy to replace the batteries in the field.
The optical ports shall have a universal optical adapter system which allows to change between different connector types. For the optical ports a robust protection cap against dust and shock should be included.

The output power of the lasers shall be adjustable between -7 and 0dBm.

Instrument specification

Parameters	Type	FP-laser
	Wavelength	Switch-able, one output port
	Center wavelength	1310 ± 20 nm and 1550 ± 20 nm
	FWHM spectral width	< 5 nm / < 5 nm
	Laser classification	laser class 1 according to IEC 825
Operating Mode	CW	output level: 0 to -7 dBm
	270 Hz, 1 kHz, 2 kHz (for line identification (Laser ON/OFF Dutycycle:50%)	calibrated output level:-3 to -10 dBm)
	Wavelength identifier	AUTO-λ = automatic λ setting with appropriate power meter
	Automatic dual wavelength transmission	TWINtest = automatic dual λ testing with appropriate power meter
Optical interface	universal interface, physical contact	FC/PC, SC/PC, LC, DIN, ST easy to clean, exchangeable
Power supply	4-way powering	Dry cells, NiCd, USB and AC-line
	Recharge capability	Internal fast charging function (2 hours), via AC-line adapter
	Operating time (typ.)	>45h
	Battery save function	Automatic shut off
Environmental conditions	Operating temperature	-10 +55 C
	Storage temperature	-40+70 C
	Rel. humidity	up to 90 %
	Electromagnetic Compatibility	CE-conformance according to EN 50081-1 / EN 50082-1

II. Optical power meter

The power meter shall be an easy operatable, lightweight, rugged and water resistant handheld instrument withstanding all practical environmental conditions like temperature, shock, bumps etc. The instruments shall use standard AA batteries –dry cells.

The instrument must cover the whole wavelength range between 800 and 1700 nm. The operation wavelength could be set to every value between 800 and 1700 nm in 1 nm increments. Automatic wavelength detection must be there.

The instrument must have no warm up time and it must use auto zeroing with no need for manual zeroing.

The optical port must have a universal optical adapter system which would allow to change between different connector types. For the optical ports a robust protection cap should be provided.

Instrument specification

Parameters	**Photodiode**	**specification**
	Wavelength range	800...1700 nm
	Switchable standard wavelengths	800…1700 nm in 1 nm steps
	Display range	-80...+15 dBm
	Display resolution	0.01 dB/0.001 µW
	Max. power level	+ 15 dBm
	Measurement uncertainty	± 0.13 dB, (±3 %)
	Type of fibre	
	SM, MM	9/125 µm, 50/125 µm respectively
	850 nm or 1300 nm	100/140 µm
Operating Mode	Display units	dB, dBm, mW, µW
Function	Dark current compensation	Automatic
	Reference setting	ABS--> REF and free settable
		Automatic wavelength detection (combined with appropriate source)
		Automatic dual or triple wavelength testing (combined with appropriate source)
	Data storage	Up to 1000 results storage must be there, results sorted by cable and fiber
	USB interface	data recall, It must be possible to control the Instrument remotely using PC
Recalibration	Recalibration Period	3 years
Optical interface	easy to clean, universal push pull	one adapter should fit all 2.5 mm connectors (e.g. SC-, DIN-, FC-, E2000)
Power supply	4-way powering	Dry cells, NiCd, USB and AC-line
	Recharge capability	Internal fast charging function (2 hours) , via AC-line adapter
	Operating time (typ.)	>100 h
	Battery save function	Automatic shut off
Environmental conditions	Operating temperature	-10+55 C
	Storage temperature	-40+70 C
	Electromagnetic Compatibility	CE-conformance acc. to EN 50081-1 / EN 50082-1

4) SDH/PDH ANALYSER

The multi-rate PDH/SDH Analyzer is required for installation, maintenance, commissioning and verification of SDH and PDH networks

4.1 GENERAL

Operation

It should have a keyboard or provision to key in alpha numeric with ease and industry-standard screen and shall display measurement results by the help of standard text processor and database programs. It shall have Standardized graphical user interface with on-line help functions. It should also be operate via touch screen/inbuilt alpha numeric keys.

Display

VGA standard high-resolution screen display with a large display screen, i.e., high contrast and wide viewing angle for quick and easy interpretation of results. User interface should be lockable, so that influences on the measurement by accidentally touching buttons or touch screen are prevented

Data I/O

Internal memory of minimum 2MB. It should also support ports for USB, Ethernet 10/100, external keyboard, mouse, RS232, parallel port

Data export

USB & Floppy disk for exporting set-ups and results (post-processing) and offline analysis possible with special SW on a standard PC and also to printer (suitable laser color printer to be provided by Vendor)

LEDs

Separate LEDs for current and stored alarms/errors in the different sections of SDH and PDH.

Environment/ Power failure

Operating temperature to be 0 to 50 deg C. Behavior in the event of external power failure: After power restoration tester is expected to continue tests without loss of obtained results. Power failure time has to be saved in the measurement report with the time stamping of the duration in millisecond resolution.

4.2 Specifications of transmitter and receiver section

Optical Interfaces

Acc. to ITU-T Rec. G.951: STM-1, STM-16
RX input sensitivity: -8 to –28 dBm
Receiver must be able to receive signals with wavelength range from 1280 to 1580nm.
Level measurement at input (Rx): resolution 1 dB / accuracy +/- 1 dB
All interfaces shall work at 1310 and 1550 nm; selectable via Software.
The connector to be FC/PC

Electrical interfaces

According to ITU Rec. G.703

Unbalanced (75 Ω): 2048, 8448, 34268 kbit/s, 51840 kbit/s: HDB3

Unbalanced (75 Ω): 139264, 155520 kbit/s: CMI

Balanced (120 Ω): 2048 kbit/s: HDB3

Adaptive equalizer (Rx) for 34/45/140/156 Mbit/s, bit rates switch able via Software

Internal clock

At all of the bit rates listed above

Stability: +/- 4ppm (+/- 1ppm per year)

Clock Synchronization

+/- 100ppm (up to STM-4) and +/- 50ppm (STM-16) to allow tests up to real system limits

Step width: 0.001 ppm / 1 ppb for fine and real life stimulation of AU pointer activities and mapping stuffing actions

Mappings

- STM-1 Mappings
- C3 (34Mbit/s) via AU-4, AU-3
- C3 (45 Mbit/s) via AU-3/AU-4 (DS3 asynchronous mode in STM-1)
- C4 (140Mbit/s) via AU-4
- C11 (1.5 Mbit/s) via AU-3/AU-4 (DS1 via TU11/TU12 selectable)
- C12 (2Mbit/s) via AU-3/AU-4; asynchronous. and floating byte synchronous mode

Shall map signals described above in STM-16 signals

STM-0 mappings: 1.5/2/34/45Mbit/s in STM-0

Generation of STM-4 signal structure conforming ITU-T G.707

Concatenated signal structure: STM-4c

- VC-4-4c container with contiguous concatenation (BULK signal)
- VC-4-4v container with virtual concatenation (BULK signal, 4 AU-4 pointers)
- Alarm generation: AU-AIS, AU-LOP

Error measurement and alarm detection: AU-AIS, AU-LOP, bit errors.

Drop & Insert

Drop and insert of one PDH-channel out of a PDH/SDH line signal and applying at a separate interface (75 Ω)

1. SDH Signals: simultaneous mapping and de mapping of PDH-signals applicable at electrical lines (STM-1/4), optical lines up to STM-16, e.g. 34M from/into STM-1 /4.
2. PDH/SDH Signals: simultaneous multiplexing and demultiplexing of any PDH tributary signals in the MUX-chain even applicable if PDH signal is transmitted in a container.

Block & replace

Replace a synchronous tributary in a synchronous signal

The received tributary is analysed ("block"), while the SOH, POH and high order tributaries (AU-3 or AU-4) is new generated ("replaced").

Payload: 140 Mbit/s, 45 Mbit/s, 34 Mbit/s, BULK signal

Errors & alarms can be inserted into SOH, POH and payload.

Through Mode

Loops signals through the instrument (transmitter and receiver synchronous).

Monitoring and drop of PDH-channels out of SDH

4.3 SPECIFICATION OF PDH/SDH-TEST AND MEASUREMENT MODES

Pointer generation/ analysis

Single and repetitive increment and decrement of AU and TU (simultaneously) pointer values.

Pointer test sequences acc. to ITU-T Rec. G.783.

Graphical histograms of pointer events versus time for absolute values, increments and decrements.

STM-4c virtual concatenation:

Manipulation & stimulation

Overhead editor/ analysis

Manipulating and editing RSOH, MSOH, HPOH, and LPOH bytes

Path trace editor and interpretation: 16 byte sequences in J0,16 and 64 byte sequences in J1 & J2

STM-4/16: SOH manipulation and analysis of SOH-Bytes, F1, F2, E1, E2, D1-3, D4-12, K1/K2, J0

Overhead byte capture + APS protocol decode

All SOH/POH Bytes at STM-0/1

All SOH/POH Bytes except of A1, A2, B1 at STM-4/16
Trigger events: MS-AIS, AU-AIS, MS-RDI, AU-LOP, editable value

Decode of captured K1 & K2 Byte (APS-standard-command).

Tandem Connection Monitoring-TCM

Capture TCM frames (N1/N2 bytes):

Trigger events: start of TCM frame (TCM FAS word)

On-line monitoring of alarms and trace identifier: TC-IEC, TC-AIS, TC-REI, TC-OEI, TC-APId

Static alarm generation (on/off), Dynamic alarm generation (SDH), Dynamic alarm generation (PDH)

Alarm detection

LOS, OOF, LOF, LSS (loss of sequence sync.), LTI (loss of timing sync.),TU-LOM, AU-/TU-LOP, AU-/TU-NDF, MS-/AU-/TU-AIS, MS-/HP-/LP-RDI, HP-/LP-PLM, RS/HP-/LP-TIM, HP-/LP-UNEQ.PDH alarms: LOF, AIS,RDI.

Error & alarm graphic

Parallel display of alarm and error histogram for easy trouble-shooting (Errors & alarms should be displayed in the same diagram with same time scale)

LED/on-Line analysis/alarm & error

LED Indication of stored & current alarms and errors

Alarms: LOS, OOF/LOF, TU-LOM, AU-/TU-LOP, MS-/AU-/TU-AIS, MS-/HP-/LPRDI, HP-/LP-PLM, and HP-/LP-UNEQ, LSS (loss of sequence sync.)

PDH alarms: LOF, AIS, RDI

Errors: B1, B2, B3, LP-BIP, TSE (test sequence error)

PDH errors: FAS, CRC.

Test sequences

PRBS: 2E11-1, 2E15-1, 2E20-1, 2E23-1, 2E15-1 inverted, 2E23-1 inverted, octet, AIS/Programmable words (16 bit pattern)

Additional STM-4c test sequences: 2E31-1, 2E31-1 inverted

Additional STS 48c / STM-16c test sequences: 2E31-1, 2E31-1 inverted

Performance analysis

Performance analysis acc. to ITU-T G.826 ISM & OOS, G.821, G.828, G.829, M.2100, M.2101 including BER for STM-1, 4,16.

Performance analysis for “bringing into service” according to ITU-T M.2110 and evaluation of “performance information” acc. to M.2120

Automatic modes

Auto configuration – automatically sets the equipment to the input signal

SCAN function – tests for error-free connection of all SDH channels

TROUBLE SCAN function – checks all incoming SDH channels for errors /alarms

AUTO SCAN function – checks the signal structure, the mapping, the payload and the trace identifiers even in mixed mapping signals
SEARCH function – searches for test channels in SDH signals.

Result storage

Parallel storage of results and instrument set-ups

Storage resolution: error results 1 second and alarms 100 ms

Capacity: minimum of 1 million entries, e.g. 30 days with 20 entries per minute

5) ETHERNET TESTER

1) General

a. The instrument should be battery operated handheld field instrument having USB interface for printers. It should have enough memory for storing results and additional interface device like PCMCIA interface/USB interface for storage/ transfer of files. The graphical user interface must have on-line help functions.

b. The test instrument shall support dual port with Tx and Rx function for 10/100/1000 MB interfaces in one module:
   1. 10/100 Base T via RJ-45 interface (Electrical interface)
   2. 1000Base SX or LX with standard GBIC (Optical interface)

2) Feature Requirements

a. The test instrument shall support Terminate, Monitor and through modes of operation. Through mode shall allow bi-direction pass through of traffic

b. The test instrument shall support simultaneous testing of 10/100 Ethernet and Gigabit Ethernet testing.

c. The test instrument shall be able to perform Ethernet Traffic Generation at full line rate, up to 1000 Mb/s.

d. The test instrument shall be able to perform standard RFC2544 test.
   Throughput Latency
   Burstability Loss

e. The test instrument shall support Ethernet testing in both end-to-end and loopback modes. The loopback should be initiated via loop-up command or via a manual line loopback on the GUI.

f. The test instrument shall support Layer 1 unframed BERT and Layer 2 BERT with standard PRBS patterns as a transmission layer verification test.

g. The test instrument shall be configured for the three traffic types: Constant, Ramp and Bursty Traffic.

h. The test instrument shall allow for configuration of the Ethernet header, including MAC Source and Destination Address, the Type/Field, as well as VLAN Tag with VLAN ID and the VLAN Priority Field (per 802.1Q/p). It will provide the user with selections of the type of Ethernet frame to be transmitted (802.3 or DIX), and will provide the user with selections for the Ethernet payload.

i. The test instrument shall have the ability to auto-negotiation and will provide support for flow-control. It provides user-selectable ability to obey or ignore received PAUSE frames.

j. Both choices must be available to the user regardless of whether auto-negotiation is enabled or disabled. Received PAUSE frames should be counted and displayed regardless of whether they are ignored or obeyed.

k. The test instrument shall allow for set-up of RX filters, based on the parameters of the Ethernet frame, IP as well as Frame type (802.3 or DIX), VLAN ID and VLAN Priority.

l. The test instrument shall allow for insertion of single or bursty FCS errors.

m. The test instrument shall support frame size from 64 bytes to 1518 bytes.

3) Analysis/Results

a. The test instrument shall report Total Link utilization (Ethernet Throughput).
b. It shall provide frame testing in conformance to the IETF RFC 1214 and 2544
c. It shall provide real-time statistics of the Ethernet Link. Key results should include:

1. Link Status – Loss of Signal, Link Active, Frame Detected, VLAN Tagged Frame Detected

2. Auto-negotiation Status – Link Configuration Acknowledgment, Link Advertisement Status, Remote Fault

3. Link/Frame Statistics – Bandwidth Utilization (Throughput), Frame Rate, Frame Length, Count of Unicast, Multicast and Broadcast Frames; Total Received Frames; Total Transmitted Frames; Frame Length Distribution; PAUSE Frames; Round-trip Delay Measurements, Service Disruption Measurement

4. Errored Statistics – Total Errored Frames, FCS Errored Frames, Runts, Undersized Frames, Jabbers, Oversized Frames, Lost Frames, Out of Sequence Frames

3.6.12 TECHNICAL SPEIFICATION FOR VIDEO CONFERENCING EQUIPMENTS

Group VC system with dual HD LCD with 8 ports MCU with IP based MCU with 720p HD resolution has to be considered. Same shall be utilized to achieve VCS functionality. One HD VCE to be supplied with Integrated Group VC system with minimum 60" HD LED screen with wall mounting kit shall be installed at VC room / conference room / control room / SIC room.

VIDEOCONFERENCING SETUP:

Video conferencing setup shall be installed to conduct various meetings and also broadcast of any event to various pipeline locations by interfacing with existing VC system of pipeline.

STANDARDS APPLICABLE

The equipments and the system provided shall conform to the latest editions of standards like ITU-T, ETSI, IEC, ISO, EIA etc.

In case of any conflict between the above standards & the specifications, the matter shall be referred to client.

DETAILED SCOPE

The Contractor's scope of work shall include but not limited to the following, as per the specifications of this Bid document:

i) System design & engineering, supply, installation, commissioning, configuration & Integration of one HD VCE and HD end points

ii) Extension & routing of AC input power cable from the 230 VAC Power points to the input of the System using suitable cable, connectors & Spike Protection Guards. The power cable shall be of suitable conductor size/dimension to limit the over heating & voltage drop.

iii) All the Cables, which are coming in & going out of the supplied equipments, shall have to be routed properly in vertical or horizontal planes along the wall. The C-Channel / cable trays of suitable dimension (matching to the color of walls) are to be used for the same.

iv) Providing safety / security of the equipment, installation materials & test equipment etc during the shipment, storage, installation & commissioning, till the system is handed over to client.

v) Site acceptance testing (SAT) covering the integration of MCU and new VC end points with existing VC equipments and thereafter commissioning of the complete system at site.

vi) Providing on-site comprehensive warranty for the performance of all supplied items for the period of 2 years & technical support during and after the warranty period in accordance with the specifications as specified in the bid document. During the warranty period, any software up-gradation of the supplied system will be done without any cost implication to client.

vii) Under warranty, in case of any failure of the supplied items, the same shall be rectified / restored as per the resolution time of the site from the placement of first service call without any cost implication.

viii) Contractor shall arrange for the commissioning spares of all systems, sub-systems & equipment that may be required during the commissioning & warranty period separately at his own cost.

ix) Supply of one set of technical literature, drawings & documentation for the complete system per site.

x) The Contractor shall also carryout any other works (including supply) not mentioned above, but required for completing the work in totality.

xi) Contractor shall ensure complete interoperability between MCU and end points in case both are provided from different OEMs.

xii) Contractor to ensure all HD display units supplied will provide 720p resolution output when connected to the videoconferencing end points.

xii) Contractor to ensure that any customized furniture provided at client Head office is in line with the current set up and look/aesthetics and should not provide inferior quality trolleys to integrate the HD LCD display units and the videoconferencing codes and camera.

FUNCTIONAL REQUIREMENTS

i) The Contractor shall offer complete solution on involving all aspects of required components, including but not limiting to provide Enterprise-wide Video Conferencing facility along with comprehensive responsibilities of sizing, design, installation, configuration, Integration, commissioning & warranty support for the supplied equipments.

ii) The VC equipments supplied by contractor shall proven new product of respective OEMs with all necessary accessories and components to meet the scope requirements of this project.

iii) The contractor shall fine tune all the VC equipments (both existing & supplied) for optimum performance in terms of effective throughput, security and reliability.

iv) All the supplied VC equipments should have the ability to work in seamless integrated mode with the MCU so that management, scheduling and administration of all VC calls is possible through Management software attached to the MCUs.

v) Contractor shall integrate all MCUs with the centralized Management suite to have a single view of all MCUs.

IP based MCU to be supplied.

Minimum Specs of server /work station :

All Workstations/ servers shall be of the following minimum specifications, unless specified otherwise:

The server/workstation shall be of the following specifications as a minimum:

a)	Processor type	Intel core 2 Quad Processors with clock speed- minimum 3.0GHz.
b)	RAM	8 GB & Expandable
c)	Operating systems/software	Window 7 or Window 2010 Server Edition
d)	Monitors	TFT LCD color monitors 22"
e)	Hard disc	500 GB & Expandable upto 1TB
f)	DVD writer	With Read & Write functions
g)	Mouse	Optical
h)	PCI express graphics card (x16)	
i)	LAN Interface	10/100 Mbps Ethernet
j)	Serial	One each
k)	USB port at front	

All software to be used shall be provided with latest anti-virus protection software. All software should be license software and certificates for the same shall be provided. Certificate of calibration of all instruments shall be provided. Warranty cards for all instruments, workstations, PCs, etc shall be provided and same shall be in the name of the Client.

Routers

a) The routers shall be of CISCO/NORTEL/ IBM make. The router shall support speed upto 2 Mbps. The Router shall have G.703 ports as per following:

Location	No. of Routers	Min. No. of WAN ports in Router	Min. No. of LAN (Ethernet) ports in each router
As per site requirements	1	2	2

The routers shall be configured for inter-connectivity of equipments as per system configuration requirement.

b) The router shall provide the facility of high and multiple protocol router and bridge that provides high bandwidth connections in to backbone networks for remote sites. The hardware design shall be based on distributed processing architecture with packets forwarding to be performed on the network interface modules. It shall be based on the modular design and architecture and shall allow new network interface cards to be added in the racks without powering down the unit and ensuring no disruption of service to the network users.

c) The router shall implement adaptive routing algorithms and network management routines while off-loading the routing burden from networks. The router shall support both intra-area and intra-area routing for transporting messages between nodes and shall support the network routing/bridging services for OSI, TCP/IP, X.25, LAT and other industry standard wide area networks/protocols.

d) In case of any conflict between the specifications, enclosed attachments, related codes and standards etc. Vendor shall refer the matter in writing to the purchaser, and shall obtain clarification in writing before starting the manufacturing/selecting of the instrument.

e) Vendor shall be responsible for selection of the correct system to meet the purchaser's specifications. In case of any modification / change in selected equipment has to be changed at a later date to meet the Purchaser's Specifications, the same shall be done by the vendor without any price and delivery implications.

f) The contractor has to do the work for all the entire sections of the pipeline with full responsibility. The equipments may be installed in the area where other contractor is working. Any coordination with other contractor as required shall be in contractor's scope.

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ANNEXURES

ANNEXURE – I

TECHNICAL CHECKLIST

ANNEXURE-I to PJS

Technical Checklists

Name of Bidder :

Bidder / Vendor works & address :

Name of Sub Vendor (as applicable) :

Sl. No	Checklist point	Yes / No
	Have you filled up the following formats, which form a part of technical checklist	
1.	Submit Un-priced SOR with indicated "Quoted" in price part	
2.	Annexure – II (Technical Questionnaire)	
3.	Annexure –III (Certificate of logistics support)	
4.	Annexure -IV (Performance Guarantee Certificate & Warranty/ Post warranty Certificate)	
5.	Annexure –V Proven track record (PTR)	
6.	Annexure –VI (Project management responsibility) (PMR)	
7.	Annexure –VII (System Proveness)	
8.	Annexure - VIII (Deviation form)	
9.	Annexure - IX –Source of supply (SOS)	
10.	Submit signed & stamped tender documents	
11.	Submit Clause wise technical compliance of PJS with Annexure	

Sl. No	Compliance to	Noted Yes / No
1.	Special Condition of Contract (SCC)	
2.	Time Schedule.	
3.	Proposed Telecommunication Network.	
4.	Tender MR , scope as per Job Specification, compliance to TS	
5.	Payment Terms as per tender	
6.	Training as per Tender	
7.	Warranty as per Tender specifications	
8.	Extended Warranty as per Tender specifications (as applicable)	
9.	Post Warranty Maintenance as per Tender specifications	
10.	Extended Storage quote per month payable as define in tender	

Signature of the Bidder authorized signatory

Name of the Bidder authorized signatory

Stamp and Date

ANNEXURE – II

TECHNICAL QUESTIONAIRE

ANNEXURE-II to PJS

TECHNICAL QUESTIONAIRE

Name of Bidder :
Bidder / Vendor works & address :
Name of Sub Vendor (as applicable) :

This questionnaire shall be dully filled in and submitted along with un-priced sets of offers to avoid further queries and to ensure proper evaluation of your offer in time. If this is not complied with your offer is liable to be rejected.

Sl. No.	DESCRIPTION	BIDDER'S RESPONSE
1.	Have you filled up 'NO DEVIATION FORM' and submitted the same?	
2.	Have you filled and submitted 'PROVEN TRACK RECORD (PTR) FORM'?	
3.	Have you filled and submitted 'SOURCE OF SUPPLY FORM'? All major equipments have to be supplied from sub vendor's given in MR	
4.	Have you provided list of 2 years spares for operation and maintenance along with unit rates?	
5.	Have you provided list of commissioning spares?	
6.	Have you provided list of mandatory spares along with detailed basis of quantities arrived at?	
7.	Have you enclosed the catalogs/literature in ENGLISH language including model decoding details, drawing etc necessary for evaluation of your offer?	
8.	Have you confirmed that documents required as per vendor data requirement will be supplied after placement of order?	
9.	Have you furnished 'LOGISTIC SUPPORT CERTIFICATE'	
10.	Have you furnished 'PERFORMANCE GUARANTEE CERTIFICATE'/ 'WARRANTY/POST WARRANTY CERTIFICATE'?	
11.	Have you furnished the necessary documents for the BEC qualification	
12.	Have you furnished 'PROJECT MANAGEMENT RESPONSIBILITY' FORM	
13.	Have you furnished 'Vendor Data Requirement' with all necessary documents	
14.	You quoted as OEM or System Integrator	
15.	Quoted for Extended warranty	
16.	You have 24 hr service support for O&M	
17.	Submit Bill of Material (including for all sub items)	
18.	Confirm that all tests will be done as per the procedure / instruction given in the tender.	
19.	Indicate deviation / discrepancy with supporting documents / reasons etc.	
20.	Quoted for Extended storage per month payable as define in tender	
21.	Quoted for Extended Warranty per month (as define in tender)	
22.	Quoted for consumer connectivity solution	
23.	Quoted for PWMC	

Signature of the Bidder authorized signatory

Name of the Bidder authorized signatory

Stamp and Date

ANNEXURE – III

CERTIFICATE OF LOGISTICS SUPPORT

ANNEXURE-III to PJS

CERTIFICATE FOR LOGISTICS SUPPORT

1.0 LOGISTIC SUPPORT CERTIFICATE

1.1 Vendor must furnish Certificate for providing necessary support services in favour of the Owner for Telecommunication System committing them to provide logistic to purchaser in the format furnished along with.

1.2 In case of bought-out items, this certificate must be furnished for each of the Sub vendors clearly indicating type, model no. etc.

1.3 The Certificates must be furnished from each manufacturer in case more than one manufacturer is proposed for an item. However it is expected that the vendor proposes
Only one approved manufacturer for an item.

1.4 The Certificate must be signed with seal by the official signatory on the company's letterhead.

CERTIFICATE FOR LOGISTICS SUPPORT

(To be signed by Manufacturer's corporate level signatory on company's letterhead)

I, on behalf of M/s_____ confirm that the Item _____ Model No._____ for quoted by M/s_____ for M/s .....(client) against Bid Doc No. ……..; respective Particular Job Specification for Telecommunication System No. MEC /05/E5/I/ PJS-097 shall continue to be supported by us for a period of minimum 10 years. The quoted system shall not be withdrawn from Indian market as a matter of our corporate policy.

I further confirm that in case of placement of order by GAIL on us, we shall continue to Support GAIL by spare part support for a period of 10 years from the date of placement of order.

Signature of the Bidder authorized signatory

Name of the Bidder authorized signatory

Stamp and Date

ANNEXURE – IV

PERFORMANCE GUARANTEE CERTIFICATE

ANNEXURE-IV A to PJS

PERFORMANCE GUARANTEE CERTIFICATE FORM

(**To be signed by Corporate level signatory on company's letterhead)**

I, _____on behalf of M/s. _____, certify that in the event of placement of order for Telecommunication system by (the owner) on us.

a) The telecommunication system complete with its performance certificate shall be Supplied by us.

b) M/s. _____, shall stand guarantee for the performance of the telecommunication system when installed along with IP EPABX system, CCTV system ……. system and associated items at site.

c) Our involvement shall be ensured during system design & engineering, factory Acceptance testing, Integrated factory acceptance testing, site execution, acceptance and commissioning and post commissioning support as per contract.

d) With the methodology proposed herein, we M/s _____ shall stand guarantee for the complete telecommunication system as per the specified Performance specification as per contract.

e) With the methodology proposed herein, we M/s _____ shall stand extended guarantee/warranty for the complete telecommunication system as per the specified Performance specification as per contract.

Signature of the Bidder authorized signatory

Name of the Bidder authorized signatory

Stamp and Date

ANNEXURE-IV B to PJS

WARRANTY/ POST WARRANTY FORM

(To be signed by Corporate level signatory on company's letterhead)

I, _____on behalf of M/s._____, certify that in the event of placement of order for Telecommunication system by owner on us.

a) The telecommunication system complete with its performance certificate shall be supplied by us.

b) Our involvement shall be ensured during system design & engineering, Factory Acceptance Testing, Integrated Factory Acceptance Testing, Site execution, acceptance and commissioning and post commissioning support as per contract.

c) With the methodology proposed herein, we M/s. _____

Shall stand extended guarantee/warranty/post warranty for the complete **SDH SYSTEM** as per contract.

Signature of the Bidder authorized signatory **Signature of the OEM authorized signatory**

Name of the Bidder authorized signatory **Name of the OEM authorized signatory**

Stamp and Date **Stamp and Date**

ANNEXURE-IV C to PJS

WARRANTY/ POST WARRANTY FORM

(To be signed by Corporate level signatory on company's letterhead)

I, _____on behalf of M/s. _____, certify that in the event of placement of order for Telecommunication system by Owner on us.

a) The telecommunication system complete with its performance certificate shall be supplied by us.

b) Our involvement shall be ensured during system design & engineering, Factory Acceptance Testing, Integrated Factory Acceptance Testing, Site execution, acceptance and commissioning and post commissioning support as per contract.

c) With the methodology proposed herein, we M/s. _____

Shall stand extended guarantee/warranty/post warranty for the complete **IP EPABX SYSTEM** as per contract.

Signature of the Bidder authorized signatory **Signature of the OEM authorized signatory**

Name of the Bidder authorized signatory **Name of the OEM authorized signatory**

Stamp and Date **Stamp and Date**

ANNEXURE-IV D to PJS

WARRANTY/ POST WARRANTY FORM

(To be signed by Corporate level signatory on company's letterhead)

I, _____on behalf of M/s. _____, certify that in the event of placement of order for Telecommunication system by Owner on us.

a) The telecommunication system complete with its performance certificate shall be supplied by us.

b) Our involvement shall be ensured during system design & engineering, Factory Acceptance Testing, Integrated Factory Acceptance Testing, Site execution, acceptance and commissioning and post commissioning support as per contract.

c) With the methodology proposed herein, we M/s. _____

Shall stand extended guarantee/warranty/post warranty for the complete **CCTV SYSTEM** as per contract.

Signature of the Bidder authorized signatory **Signature of the OEM authorized signatory**

Name of the Bidder authorized signatory **Name of the OEM authorized signatory**

Stamp and Date **Stamp and Date**

ANNEXURE-IV E to PJS

WARRANTY/ POST WARRANTY FORM

(To be signed by Corporate level signatory on company's letterhead)

I, _____ on behalf of M/s. _____ certify that in the event of placement of order for Telecommunication system by Owner on us.

a) The telecommunication system complete with its performance certificate shall be supplied by us.

b) Our involvement shall be ensured during system design & engineering, Factory Acceptance Testing, Integrated Factory Acceptance Testing, Site execution, acceptance and commissioning and post commissioning support as per contract.

c) With the methodology proposed herein, we M/s. _____

Shall stand extended guarantee/warranty/post warranty for the complete **CCTV CAMERA (PTZ/ Fixed type)** as per contract.

Signature of the Bidder authorized signatory **Signature of the OEM authorized signatory**

Name of the Bidder authorized signatory **Name of the OEM authorized signatory**

Stamp and Date **Stamp and Date**

ANNEXURE-IV F to PJS

WARRANTY/ POST WARRANTY FORM

(To be signed by Corporate level signatory on company's letterhead)

I, _____ on behalf of M/s. _____ certify that in the event of placement of order for Telecommunication system by GAIL on us.

a) The telecommunication system complete with its performance certificate shall be supplied by us.

b) Our involvement shall be ensured during system design & engineering, Factory Acceptance Testing, Integrated Factory Acceptance Testing, Site execution, acceptance and commissioning and post commissioning support as per contract.

c) With the methodology proposed herein, we M/s. _____

Shall stand extended guarantee/warranty/post warranty for the complete …… as per contract.

Signature of the Bidder authorized signatory **Signature of the OEM authorized signatory**

Name of the Bidder authorized signatory **Name of the OEM authorized signatory**

Stamp and Date **Stamp and Date**

ANNEXURE – V

PROVEN TRACK RECORD (PTR)

ANNEXURE-V to PJS

PROVEN TRACK RECORD FORM (PTR)

Name of Bidder :
Bidder / Vendor works & address :
Name of Sub Vendor (as applicable) :

Sl. No.	DESCRIPTION	TO BE FILLED BY BIDDER
	DETAILS OF ALL EQUIPMENTS , SUB SYSTEMS AS OFFERED FOR PHULPUR HALDIA REGION TELECOMMUNICATION SYSTEM	
A	**STM-4 EQUIPMENT**	
1	Make & Model No.	
2	Details of the project where used earlier	
3	Name of Owner	
4	Name & address of Owner's contact person	
5	Telephone No. & Fax	
6	Name of Manufacturer	
7	Date, month & year of commissioning of STM-4 equipment.	
8	Any system breakdown	
9	Cause of breakdown	
10	Whether similar equipment offered for PHULPUR-HALDIA REGION pipeline project.(YES/NO)	
11	Manufacturing facility from where STM-4 equipment was supplied for the earlier project and furnished proven certificate.	
12	Mention Manufacturing facility of STM-4 equipment For PHULPUR-HALDIA REGION. Bidder to ensure this facility has to be same as in Cl. No. 11; otherwise the bid will be evaluated as per the terms & conditions of the tender.	
B	**STM-16 EQUIPMENT**	
1	Make & Model No.	
2	Details of the project where used earlier	
3	Name of Owner	
4	Name & address of Owner's contact person	
5	Telephone No. & Fax	
6	Name of Manufacturer	
7	Date, month & year of commissioning of STM-16 equipment.	
8	Any system breakdown	
9	Cause of breakdown	
10	Whether similar equipment offered for PHULPUR-HALDIA REGION pipeline project (YES/NO)	
11	Manufacturing facility from where STM-16 equipment was supplied for the earlier project and furnished proven certificate.	
12	Mention Manufacturing facility of STM-16 equipment For PHULPUR-HALDIA REGION. Bidder to ensure this facility has to be same as in Cl. No. 11; otherwise the bid will be evaluated as per the terms & conditions of the tender.	
C	**NETWORK MANAGEMENT SYSTEM (SDH EQPT)**	
1	Make & Model & Version No.	
2	Details of the project where used earlier	
3	Name of Owner	
4	Name & address of Owner's contact person	
5	Telephone No. & Fax	
6	Name of Manufacturer	
7	Date, month & year of commissioning of NMS.	
8	Any system breakdown	
9	Cause of breakdown	
10	Whether similar NMS offered for PHULPUR-HALDIA REGION pipeline project (YES/NO)	

11	Manufacturing facility from where NMS was supplied for the earlier project and furnished proven certificate.	
12	Mention Manufacturing facility of NMS for PHULPUR-HALDIA REGION. Bidder to ensure this facility has to be same as in Cl. No. 11; otherwise the bid will be evaluated as per the terms & conditions of the tender.	
D	**PRC & REFERENCE CLOCK (GPS)**	CESIUM/GPS
1	Make & Model No.	
2	Details of the project where used earlier	
3	Name of Owner	
4	Name & address of Owner's contact person	
5	Telephone No. & Fax	
6	Name of Manufacturer	
7	Date, month & year of commissioning of Clock	
8	Any system breakdown	
9	Cause of breakdown	
10	Whether similar equipment offered for pipeline project (YES/NO)	
11	Manufacturing facility from where Clock was supplied for the earlier project and furnished proven certificate.	
12	Mention Manufacturing facility of Clock. Bidder to ensure this facility has to be same as in Cl. No. 11; otherwise the bid will be evaluated as per the terms & conditions of the tender.	
E	**IP ELECTRONIC EXCHANGE (EPABX)**	
1	Make & Model No.	
2	Details of the project where used earlier	
3	Name of Owner	
4	Name & address of Owner's contact person	
5	Telephone No. & Fax	
6	Name of Manufacturer	
7	Date, month & year of commissioning of EPABX	
8	Any system breakdown	
9	Cause of breakdown	
10	Whether similar equipment offered for pipeline project (YES/NO)	
11	Manufacturing facility from where EPABX was supplied for the earlier project and furnished proven certificate.	
12	Mention Manufacturing facility of EPABX. Bidder to ensure this facility has to be same as in Cl. No. 11; otherwise the bid will be evaluated as per the terms & conditions of the tender.	
F	**CCTV System**	
1	Make & Model No.	
2	Details of the project where used earlier	
3	Name of Owner	
4	Name & address of Owner's contact person	
5	Telephone No. & Fax	
6	Name of Manufacturer	
7	Date, month & year of commissioning of CCTV System	
8	Any system breakdown	
9	Cause of breakdown	
10	Whether similar equipment offered pipeline project (YES/NO)	
11	Manufacturing facility from where CCTV System was supplied for the earlier project and furnished proven certificate.	
12	Mention Manufacturing facility of CCTV System. Bidder to ensure this facility has to be same as in Cl. No. 11; otherwise the bid will be evaluated as per the terms & conditions of the tender.	
G	**CCTV Camera (PTZ type with IR illuminator)**	
1	Make & Model No.	
2	Details of the project where used earlier	
3	Name of Owner	

4	Name & address of Owner's contact person	
5	Telephone No. & Fax	
6	Name of Manufacturer	
7	Date, month & year of commissioning of CCTV Camera (PTZ type with IR illuminator)	
8	Any system breakdown	
9	Cause of breakdown	
10	Whether similar equipment offered for pipeline project (YES/NO)	
11	Manufacturing facility from where CCTV Camera (PTZ type with IR illuminator) was supplied for the earlier project and furnished proven certificate.	
12	Mention Manufacturing facility of CCTV Camera (PTZ type with IR illuminator) Bidder to ensure this facility has to be same as in Cl. No. 11; otherwise the bid will be evaluated as per the terms & conditions of the tender.	
H	**CCTV Camera (Fixed with IR illuminator)**	
1	Make & Model No.	
2	Details of the project where used earlier	
3	Name of Owner	
4	Name & address of Owner's contact person	
5	Telephone No. & Fax	
6	Name of Manufacturer	
7	Date, month & year of commissioning of CCTV Camera (Fixed type with IR illuminator)	
8	Any system breakdown	
9	Cause of breakdown	
10	Whether similar equipment offered pipeline project (YES/NO)	
11	Manufacturing facility from where CCTV Camera (Fixed type with IR illuminator) was supplied for the earlier project and furnished proven certificate.	
12	Mention Manufacturing facility of CCTV Camera (Fixed type with IR illuminator). Bidder to ensure this facility has to be same as in Cl. No. 11; otherwise the bid will be evaluated as per the terms & conditions of the tender.	
I	**VIDEO CONFERENCING System**	
1	Make & Model No.	
2	Details of the project where used earlier	
3	Name of Owner	
4	Name & address of Owner's contact person	
5	Telephone No. & Fax	
6	Name of Manufacturer	
7	Date, month & year of commissioning of VC System	
8	Any system breakdown	
9	Cause of breakdown	
10	Whether similar equipment offered pipeline project (YES/NO)	
11	Manufacturing facility from where VC System was supplied for the earlier project and furnished proven certificate.	
12	Mention Manufacturing facility of VC System. Bidder to ensure this facility has to be same as in Cl. No. 11; otherwise the bid will be evaluated as per the terms & conditions of the tender.	
J	**TEST INSTRUMENTS**	
1	Make & Model No.	
2	Details of the project where used earlier	
3	Name of Owner	
4	Name & address of Owner's contact person	
5	Telephone No. & Fax	
6	Name of Manufacturer	
7	Date OF SUPPLY	
8	Any system breakdown	

9	Cause of breakdown	
10	Whether similar equipment offered pipeline project (YES/NO)	
K	**Whether Documentation in support of successful commissioning of above individual Equipments / items furnished for ascertaining field proveness criteria of minimum 6 month from bid due date (Yes /No)**	

Signature of the Bidder authorized signatory

Name of the Bidder authorized signatory

Stamp and Date

ANNEXURE – VI

PROJECT MANAGEMENT RESPONSIBILITY (PMR)

ANNEXURE-VI to PJS

PROJECT MANAGEMENT AND RESPONSIBILITY (PMR) FORM

Name of Bidder :
Bidder / Vendor works & address :
Name of Sub Vendor (as applicable) :
The bidder shall be entirely and exclusively responsible for all works under this bid document.
Bidder to fill up blank spaces (marked (x)), of this form; Legend: NA – Not applicable

S. No.	Description	Performed by (name) Bidder/Sub vendor	Place of execution of the activity
	Single source responsibility including Design, Engineering, Supply of total Telecommunication system including all related goods and providing all related services including installation, testing, integration, trial run, commissioning & warranty for the successful completion of the project.	Bidder (x)	NA
1	System design, Engineering for: a) OFC based SDH communication system b IP Exchange with Phones c) Clock d) Leased lines e) CCTV System F) VC SYSTEM	 (x) (x) (x) (x) (x) (x)	 (x) (x) (x) (x) (x) (x)
2	Documentation	Bidder (x)	NA
3	FAT - SDH	Bidder along with manufacturing representative	Manufacturing facility of equipment.
4	Integrated factory testing: a) All SDH equipment b) All Clock c) All IP Exchange with Phones d)All CCTV System E) VC SYSTEM	Bidder along with manufacturing representative	Manufacturing facility of SDH equipment or proven Integration Center proposed by Bidder
5	Installation, site testing and commissioning for: a) SDH equipment b) IP Exchange with Phones c) Clock d) Leased lines e) CCTV System F) VC SYSTEM	 (x) (x) (x) (x) (x) (x)	 SITE SITE SITE SITE SITE SITE

Signature of the Bidder authorized signatory

Name of the Bidder authorized signatory

Stamp and Date

ANNEXURE – VII

SYSTEM PROVENNESS

ANNEXURE-VII to PJS

SYSTEM PROVENESS FORM

The bidder shall furnish the information and documents for all works under this bid document. In order to enable the purchaser to assess the proveness of the proposed equipments / system, the bidder shall provide relevant and necessary documentary evidence e.g. proof or certificates from users towards satisfactory performance of system, etc. client / Consultant reserves the right to verify, if so desired, the Correctness of documentary evidence furnished by the bidder, for which the bidder shall arrange necessary permissions etc.

S. No.	Criteria	Complied/ Not Complied	Remarks
1	The SDH equipment being offered (Make and model no.) should have been employed in at least one network. The network, along with associated NMS and protection systems, should be working successfully for at least last six months from bid due date.		Following documents are enclosed (list to be furnished)
(a)	The SDH (STM 16) equipment being offered (Make and model no.)		----do----
(b)	The SDH (STM 4) equipment being offered (Make and model no.)		----do----
3	IP EPABX System with Telephones		---- do----
4.	CCTV System with software & hardware		---- do----
5.	CCTV Camera (PTZ type)		----do----
6.	CCTV Camera (Fixed type)		------do----
7.	Clock		---- do----
8.	VC System		---- do----
9.	Leased Line service provider		---- do----

Signature of the Bidder authorized signatory

Name of the Bidder authorized signatory

Stamp and Date

ANNEXURE – VIII

DEVIATION FORM

ANNEXURE-VIII to PJS

DEVIATION FORM

Name of Bidder :

Schedule of Deviation :

1. Please note that this is a "NO DEVIATION TENDER".
2. Bidder may given here a consolidated list of deviations/ clarifications/ comments of all sections of the bid package, which for an appropriate offer are considered unavoidable by him.
3. Deviations/ clarifications mentioned elsewhere in the offer shall not be bidding on the Client / Consultant and any such deviations if indicated elsewhere other than this form will render the offer non-responsive and shall liable to be rejected.
4. Bidder shall state the reasons for the deviations in the 'Remark' column.
5. All other clauses of the bid package shall be deemed and has to be fully complied by the Bidder.
6. **Only the deviations listed herein, in conjunction with the Bid package, shall constitute the contract requirements for the award of job to the Bidder.**

S.No.	Page No.	Clause No.	Requirement	Deviations as per Bid package	Clarification/ Comments by Bidder	Remarks
1						
2						
3						
4						
5						
6						
7						
8						
9						

Signature of the Bidder authorized signatory

Name of the Bidder authorized signatory

Stamp and Date

ANNEXURE – IX

SOURCE OF SUPPLY (SOS)

ANNEXURE-IX to PJS

SOURCE OF SUPPLY FORM (SOS) FORM

Name of Bidder :

Bidder / Vendor works & address :

Name of Sub Vendor (as applicable) :

This form shall be duly filled and signed by bidder and it shall be submitted along with bid. All the points shall be unambiguously responded, if anything is kept blank by the bidder, it shall be considered as non-compliance of the tender and the bid shall be liable for rejection.

Sl. No.	Description	Make	Model No.	Place of manufacturing and supply	Name of the Company / Organization responsible for support and maintenance facilities for this item / system
A	OFC BASED SDH SYSTEM 1. SDH- 4 & 16 Equipment (MR) 2. Reference clocks GPS/Cesium 3. Network Managements system (NMS) a) Hardware b) Software 4. Equipment Racks 5. Any other items				
B	IP ELECTRONIC EXCHANGE 1. EPABX 2. NMS a) Hardware b) Software 3. Telephones (a) Analog push button type (b) Explosion proof (c) Acoustic booth (d) IP phone (e) Weatherproof phones 4. Any other items				
C	CCTV SYSTEM 1.CCTV Camera (PTZ type with IR Illuminator) 2.CCTV Camera (Fixed type with IR Illuminator) 3.Network Video Recorders (NVR) a) Hardware b) Software 4.Screen				
D	DC-DC Converter/AC-DC Converter (Eltek / Delta / Dyna)				
E	OFC to RS 232/485 converter				

F	Video Conferencing System				
G	Test equipments a) Digital Multimeter b) OTDR Meter c) …….Test Instmn d) Laser Source and Power Meter e) SDH Analyser				
H	Special Tools and Tackles				
I	LCT (Local Craft terminal) Hardware (HP / IBM / Digital/Dell)				
J	Lease lines				
K	Any other items				

Signature of the Bidder authorized signatory

Name of the Bidder authorized signatory

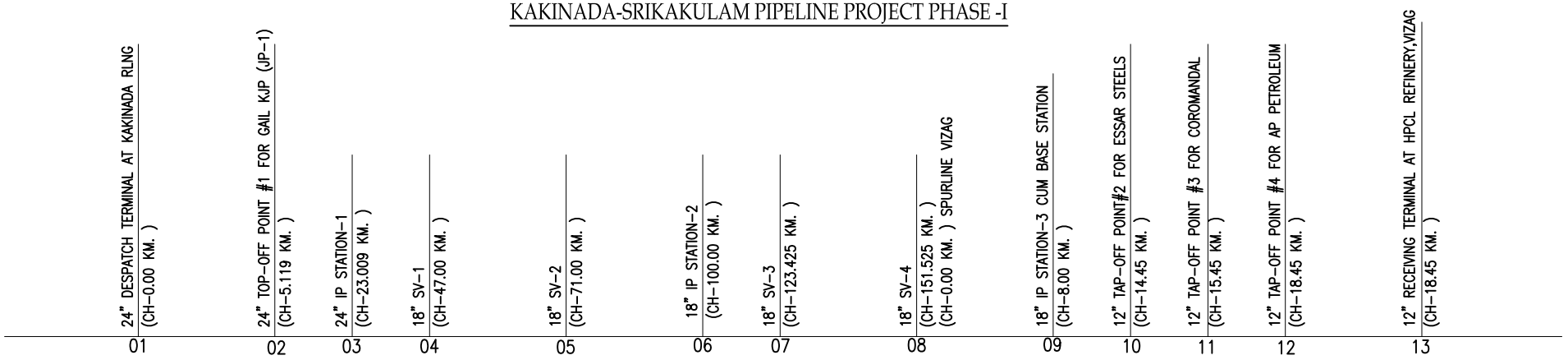
Stamp and Date

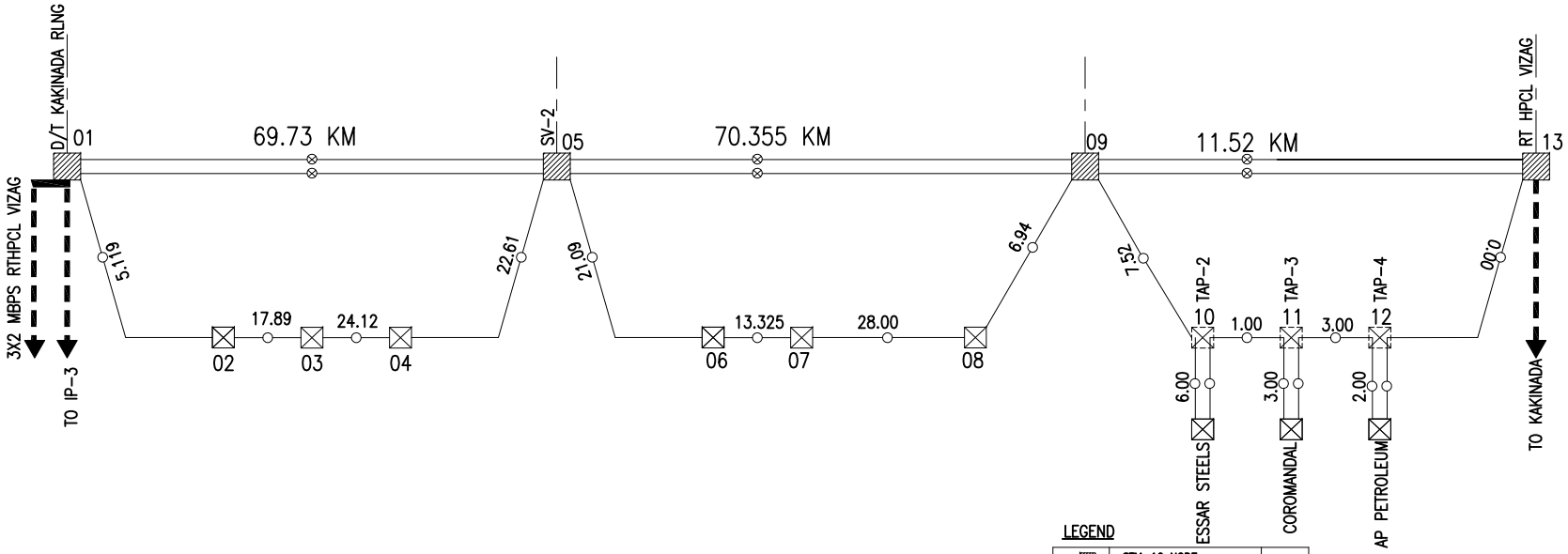
ANNEXURE – X

SUGGESTED TELECOMMUNICATION NETWORK

DRG. NO. MEC/05/E5/23QC/T-001

SUGGESTED TELECOMMUNICATION NETWORK FOR KAKINADA-SRIKAKULAM PIPELINE PROJECT PHASE -I





NOTES

1. THE ABOVE DISTANCES (SHOWN IN DIGIT) ARE PHYSICAL PIPELINE CHAINAGES IN KMS, FOR FIBRE DISTANCES APPROPRIATE 5% ADDITIONAL LENGHTS TO BE CONSIDERED.
2. CONSUMER LOCATION STM4 EQUIPMENT HAS TO BE ROUTED THROUGH TAP-OFF 2, 3, 4.
3. SV-3 AND SV-4 ARE FUTURE DISPATCH RECEIVING STATION THEREFORE EQUIPMENT SHALL BE CAPABLE TO SUPPORT THE PRESENT REQUIREMENTS AND 50% SPARE CAPACITY FOR FUTURE REQUIREMENT OF PRESENT CAPACITY
4. FOR THE LOCATION DETAILS; REFER PIPELINE SCHEMATICS DRG NO :- MEC/23QC/05/28/M/000/1021.
5. 1 NO STM -16 SPARE, EQPT CONFIG SIMILAR TO DT KAKINADA; 2 NOS STM-4 SPARE EQPT CONF SIMILAR TO SV -2, LOCATION IN DETAILED ENGG.

LEGEND

▨	STM-16 NODE	04 NOS.
⊠	STM-4 NODE	09 NOS.
—○—	STM OPTICAL LINK	
—⊗—	STM-16 (1+1 LINK)	
▬ ▬	LEASED LINE (NX2 MBPS)	

ANDHRA PRADESH GAS DISTRIBUTION CORPORATION LTD

मेकॉन लिमिटेड

MECON LIMITED

KAKINADA-SRIKAKULAM GAS P/L PROJECT

SUGGESTED TELECOMMUNICATION NETWORK KAKINADA-SRIKAKULAM P/L PROJECT (PHASE -I)

SECTION	INSTRUMENTATION & PC
LOCATION	NEW DELHI
DESIGNED	NEERAJ
DRAWN	SANDEEP
CHECKED AND VERIFIED	VIKAS
APPROVED	PANKAJ
DATE	15.10.2016

SCALE : NTS

DRG. NO. MEC/05/E5/23QC/T-001

REV 0

REFERENCES | DRG.NO.

CONCURRED BY

REV.NO | DATE | ZONE | DESCRIPTION | BY | VERIFIED — REVISION

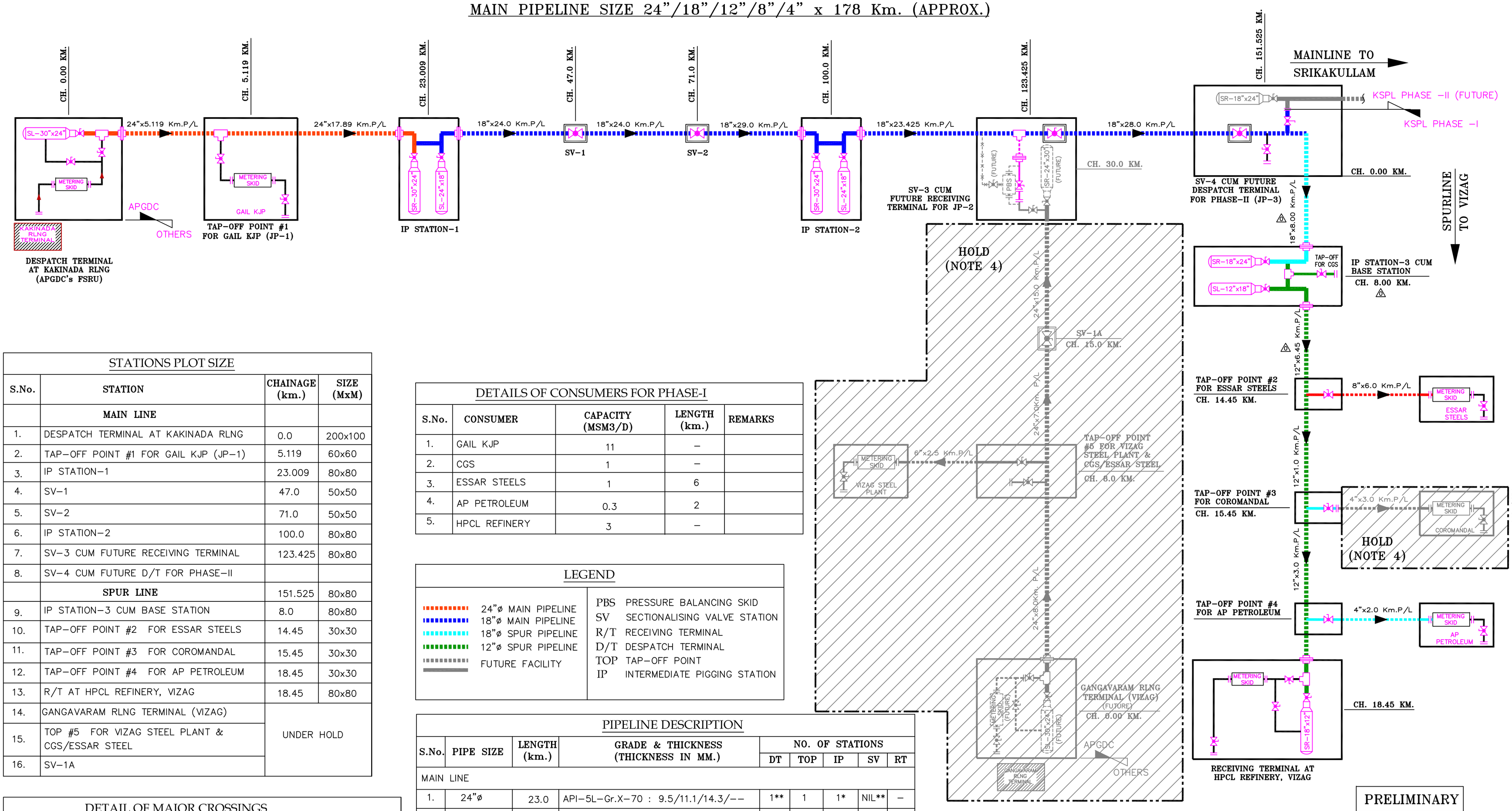
ANNEXURE – XI

PIPELINE SCHEMATIC ROUTE DIAGRAM

DRG. NO. MEC/23QC/05/28/M/000/1021

KAKINADA – SRIKAKULAM PIPELINE PROJECT (PHASE-I) SCHEMATIC ROUTE DIAGRAM

MAIN PIPELINE SIZE 24"/18"/12"/8"/4" x 178 Km. (APPROX.)



STATIONS PLOT SIZE

S.No.	STATION	CHAINAGE (km.)	SIZE (MxM)
	MAIN LINE		
1.	DESPATCH TERMINAL AT KAKINADA RLNG	0.0	200x100
2.	TAP-OFF POINT #1 FOR GAIL KJP (JP-1)	5.119	60x60
3.	IP STATION-1	23.009	80x80
4.	SV-1	47.0	50x50
5.	SV-2	71.0	50x50
6.	IP STATION-2	100.0	80x80
7.	SV-3 CUM FUTURE RECEIVING TERMINAL	123.425	80x80
8.	SV-4 CUM FUTURE D/T FOR PHASE-II		
	SPUR LINE	151.525	80x80
9.	IP STATION-3 CUM BASE STATION	8.0	80x80
10.	TAP-OFF POINT #2 FOR ESSAR STEELS	14.45	30x30
11.	TAP-OFF POINT #3 FOR COROMANDAL	15.45	30x30
12.	TAP-OFF POINT #4 FOR AP PETROLEUM	18.45	30x30
13.	R/T AT HPCL REFINERY, VIZAG	18.45	80x80
14.	GANGAVARAM RLNG TERMINAL (VIZAG)	UNDER HOLD	
15.	TOP #5 FOR VIZAG STEEL PLANT & CGS/ESSAR STEEL		
16.	SV-1A		

DETAILS OF CONSUMERS FOR PHASE-I

S.No.	CONSUMER	CAPACITY (MSM3/D)	LENGTH (km.)	REMARKS
1.	GAIL KJP	11	–	
2.	CGS	1	–	
3.	ESSAR STEELS	1	6	
4.	AP PETROLEUM	0.3	2	
5.	HPCL REFINERY	3	–	

LEGEND

24"ø MAIN PIPELINE	PBS PRESSURE BALANCING SKID
18"ø MAIN PIPELINE	SV SECTIONALISING VALVE STATION
18"ø SPUR PIPELINE	R/T RECEIVING TERMINAL
12"ø SPUR PIPELINE	D/T DESPATCH TERMINAL
FUTURE FACILITY	TOP TAP-OFF POINT
	IP INTERMEDIATE PIGGING STATION

PIPELINE DESCRIPTION

S.No.	PIPE SIZE	LENGTH (km.)	GRADE & THICKNESS (THICKNESS IN MM.)	NO. OF STATIONS				
				DT	TOP	IP	SV	RT
MAIN LINE								
1.	24"ø	23.0	API-5L-Gr.X-70 : 9.5/11.1/14.3/--	1**	1	1*	NIL**	–
2.	18"ø	128.5	API-5L-Gr.X-70 : 7.1/8.7/10.3/--	–	–	1	4	–
SPUR LINE								
3A.	18"ø	10.45	API-5L-Gr.X-70 : –/8.7/10.3/12.7	–	–	–	–	–
3B.	12"ø	8.0	API-5L-Gr.X-70 : --/--/7.9/9.5	–	3	1#	–	1
3C.	8"ø/6"ø/4"ø	8.0**	ASTM A106 Gr.B : 7.1/7.1/6.4-CLASS 4					
TOTAL		177.95		1**	4	3	5	1

* IP-1 (24" & 18")
IP-2 (18" & 18")
IP-3 (18" & 12")

DETAIL OF MAJOR CROSSINGS

S.No.	SYMBOL OF X-ING	TYPE OF X-ING	QTY. (Nos.)
1.		RIVER	TO BE FURNISHED AFTER RECEIPT OF SURVEY DATA
2.		RAILWAY	
3.		NATIONAL / STATE HIGHWAY	

PRELIMINARY

ANDHRA PRADESH GAS DISTRIBUTION CORPORATION LTD

मेकॉन लिमिटेड

MECON LIMITED

NOTES:–

1. ALL CHAINAGES INDICATED ARE IN KMS.
2. LOCATION OF IP & SV STATION ARE INDICATIVE ONLY AND EXACT LOCATIONS SHALL BE FINALISED DEPENDING ON AVAILABILITY OF PLOT.
3. NO. OF STATIONS (SVs & IPs) ARE BASED ON PRELIMINARY PDI DATA FURNISHED BY APGDC ON 22/06/16. CONSIDERING CLASS 1 FOR MAIN LINE. STATUS MAY CHANGE AFTER RECEIPT OF FINAL SURVEY REPORT.
4. UNDER HOLD VIDE APGDC EMAIL DTD 04/07/16.
5. (**) GANGAVARAM MAINLINE UNDER HOLD.
6. 12" SPUR LINE IS ASSUMED NOT TO BE CLASS 4.

REV	DATE	ZONE	DESCRIPTION / REVISION	BY	VERIFIED
A	16.07.16		REVISED AS PER COMMENTS FROM APGDC VIDE EMAIL DTD 15/07/16.	AA	SK
B	12.07.16		REVISED AS PER COMMENTS FROM APGDC VIDE EMAIL DTD 04/07/16.	AA	SK

REV / INST. / SEC — CONCURRED BY

HYDRAULIC SIMULATION DATED 12/07/16

REFERENCES — DRG.NO.

SECTION	OIL & GAS
LOCATION	DELHI
DESIGNED	ABHISHEK
DRAWN	SUNIL
CHECKED AND VERIFIED	SUNIL KUMAR
APPROVED	SIG (R.K.NARAYAN)
	DATE 07.10.2015

KAKINADA – SRIKAKULAM GAS PIPELINE PROJECT (PHASE-I)

PIPELINE SCHEMATIC DIAGRAM

SCALE : NTS — REV

DRG. NO. MEC/23QC/05/28/M/000/1021 — 0

ANNEXURE – XIII

LEASED LINE PROPOSED

Point-to-Point Ethernet or E-1 Link

(Based on the site survey, location of installation and end to end connectivity requirements, however same will be finalized during detailed engineering)

S. No	Location-A	Location-B	Bandwidth
1	DT KAKINADA	RT HPCL VIZAG	3 X 2 Mbps
2	DT KAKINADA	IP-3 CUM BACKUP STATION	2 Mbps

ANNEXURE – XIV
DETAILS OF LOCATION /STATIONS
POWER AVAILABILITY

SCADA & TELECOMMUNICATION REQUIREMENTS FOR KAKINADA SRIKAKULAM GAS PIPELINE PROJECT (PHASE - I)						
Location / Power availability / Stations						
SL. NO.	LOCATION	Power proposed through UPS	Telecom SDH/CCTV/ Cameras/ VC IP EPABX/Telephones	Power proposed through UPS	Proposed locations (tentative) For PTZ & Fixed Camera, Phones (Note -1)	REMARKS
	KSPL (PHASE - I)					
A	**DESPATCH TERMINALS**					
1	KAKINADA RLNG	24 V DC; 250 Watts	DESPATCH TERMINALS	(-) 48 V DC; 400 watts ; 230 V AC UPS 8000 watts	Control room, Guard Room	
B	**TAP - OFF POINT**					
1	TOP #1 FOR GAIL KJP (JP - 1)	24 V DC; 250 Watts	TAP - OFF POINT	(-) 48 V DC; 400 watts	Control room, Guard Room	
C	**SV STATIONS**					
1	SV - 1	24 V DC; 250 Watts	SV STATIONS	(-) 48 V DC; 400 watt	Control room, Guard Roo	
2	SV - 2	24 V DC; 250 Watts	SV STATIONS	(-) 48 V DC; 400 watt	Control room, Guard Roo	
3	SV -3 CUM FUTURE RECEIVING TERMINAL FOR JP - 2	24 V DC; 250 Watts	SV -3 CUM FUTURE RECEIVING TERMINAL	(-) 48 V DC; 400 watts	Control room, Guard Room	
4	SV - 4 CUM FUTURE DESPATCH TERMINAL FOR PHASE - II(JP - 3)	24 V DC; 250 Watts	SV -3 CUM FUTURE RECEIVING TERMINAL	(-) 48 V DC; 400 watts	Control room, Guard Room	
D	**IP STATIONS**					
1	IP STATION - 1	24 V DC; 250 Watts	IP STATIONS	(-) 48 V DC; 400 watt	Control room, Guard Roo	
2	IP STATION - 2	24 V DC; 250 Watts	IP STATIONS	(-) 48 V DC; 400 watt	Control room, Guard Roo	
3	IP STATION -3 CUM BASE STATION	24 V DC; 250 Watts	IP STATIONS	(-) 48 V DC; 400 watts ; 230 V AC UPS 8500 watts	Control room, Guard Room	
E	**CONSUMERS**					
1	ESSAR STEELS	24 V DC; 250 Watts	CONSUMERS	(-) 48 V DC; 400 watt	Control room, Guard Roo	
2	COROMANDAL	24 V DC; 250 Watts	CONSUMERS	(-) 48 V DC; 400 watt	Control room, Guard Roo	
3	AP PETROLEUM	24 V DC; 250 Watts	CONSUMERS	(-) 48 V DC; 400 watt	Control room, Guard Roo	
F	**RECEIVING TERMINALS**					
1	HPCL REFINERY, VIZAG	24 V DC; 250 Watts	CONSUMERS	(-) 48 V DC; 400 watt	Control room, Guard Roo	

Note - 1: The PTZ camera shall be installed at top of the building, fixed at/ near to Guard room for SV / DT with/without small pole 1-2 mtr. For RT Pole of 3-5 mtr for PTZ has to be provided. Phones shall be installed in telecom control room and the guard room (appx 15-20 mtr apart)

ANNEXURE – XV

Proposed Equipment Deployment APGDC

As on 16.12.2016

SCADA & TELECOMMUNICATION REQUIREMENTS FOR KAKINADA SRIKAKULAM GAS PIPELINE PROJECT (PHASE - I)																			
SL. NO	LOCATION	SCADA Server	RTU	RWS	STM-16	STM-4	IP EPABX SERVER	PTZ CAMERA	FIXED CAMERA	ANALOG PHONES	IP PHONE	IP PHONES WITH VIDEO Screen	EXP. PHONES WITH ACOUSTIC BOOTH	WP PHONE	PRIMARY CLOCKS	SECONDARY CLOCKS	CCTV SERVER	LCT	VC EQUIPMENT
	KSPL (PHASE - I)																		
A	DESPATCH TERMINALS																		
1	KAKINADA RLNG	1	1		1		1	2	4	25	5	1	1		1		1 Main	1	1
B	TAP - OFF POINT																		
1	TOP #1 FOR GAIL KJP (JP - 1)		1			1		1	2	2		0		1					
C	SV STATIONS																		
1	SV - 1		1			1		1	2	2				1					
2	SV - 2		1		1			1	2	2				1					
3	SV -3 CUM FUTURE RECEIVING TERMINAL FOR		1			1		1	2	2		0	1	0					
4	SV - 4 CUM FUTURE DESPATCH TERMINAL FOR		1		1	0		2	2	2	1	0	1	0					
D	IP STATIONS																		
1	IP STATION - 1		1			1		2	2	2	1		1	0					
2	IP STATION - 2		1			1		2	2	2	1		1	0					
3	IP STATION -3 CUM BASE STATION	1	1			1		2	4	10	2	1	1	0		1	1 Fail	1	1
E	CONSUMERS																		
1	ESSAR STEELS		1			1		1	2	2	1		1						
2	COROMANDAL		1			1		1	2	2	1		1						
3	AP PETROLEUM		1			1		1	2	2	1		1						
F	RECEIVING TERMINALS																		
1	HPCL REFINERY, VIZAG	1	1		1			2	2	2	1	0	1						
G	SPARES		3		1	2		3	3	6	2		1	1					
	TOTAL - PHASE I	3	16	0	5	11	1	22	33	63	16	2	11	4	1	1	2	2	2